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The journal aims to allow research in botanical topics such as taxonomy, systematics, nomenclature, molecular phylogeny, conservation, biogeography, and history of botany, and botanical collections.
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Webbia had been created in honor of **Philip Barker Webb** (1793-1845), a close friend of Filippo Parlatore, who before passing away entrusted his personal herbarium and a library rich of old botanical books and publications to the then Botanical Museum in Florence.

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Novitates Bruneienses, 11. A Checklist of the Ferns and Lycophytes of Brunei Darussalam (In continuation of studies of Brunei pteridophytes initiated by David S. Edwards)

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Abstract. A checklist of all species of ferns and fern allies that are known in Brunei is presented. The native, introduced, and endemic status in Borneo for all taxa are given. Ecological notes on distribution within Brunei as well as abundance or rarity are also provided. This checklist comprises 32 families, 106 genera and 364 species. We examined and re-identified all specimens of ferns and lycophytes in the National Herbarium of Brunei Darussalam (BRUN) at the Forestry Department and the University of Brunei Darussalam herbarium (UBDH) accordingly. The checklist suggests the threat status for each species, specifically, if it may be of least concern or rare in Brunei. Additionally, five new species belonging to the family Polypodiaceae are newly described here, viz., *Acrosorus pectinatus* Parris, *Calymmodon ashtonii* Parris, *Calymmodon minutus* Parris, *Calymmodon rupicola* Parris, and *Ctenopterella rivularis* Parris.

Keywords: Borneo, ferns, Lycophytes, plant diversity, Pteridophytes.

INTRODUCTION

Borneo is the third largest island in the world, located at the centre of Malesia, the vast Southeast Asian archipelago. The larger part of the island (nearly 73%) is represented in the eastern and southern portion by Indonesian Kalimantan, in the northern and north-western part by the component territories of Malaysia (Sabah, Sarawak, and the Malaysian Federal Territory of Labuan Island), and the Sultanate of Brunei Darussalam. A recent estimate of the total vascular flora of the Malesian region (the phytogeographic region from Sumatra, across Malaysia and the Philippines, eastwards to New Guin-

ea), is estimated to be around 42,000 plant species (Joyce et al. 2020). Borneo, with an up-to-date checklist, harbours an astonishing 271 families with 12,590 vascular plant species (Wong 2023).

The term *Pteridophyta* was first introduced by Ernst Haeckel in 1866 to classify a group of vascular plants that reproduce via spores rather than seeds. This group includes ferns, clubmosses, and horsetails. The name is derived from the Greek words *pteron* ("feather") and *phyton* ("plant"), a reference to the feather-like morphology of fern fronds (Haeckel 1866).

Pteridophyte (ferns and lycophytes) research in the Malesian region can be highlighted in several stages. The Malayan Fern Allies handbook by van Alderwerelt van Rosenburgh in 1908, with a later supplement in 1917, enumerated 1495 species for the entire Malesian region. This was the first and most comprehensive account which covered the pteridophyte diversity of ferns in the islands of this region. Masamune (1945) also published a list of Bornean pteridophytes, enumerating a total of 963 species of ferns and fern-allies. Another insight is from the Flora of Malaya Volume II, Ferns of Malaya by Holttum (1966), wherein close to 600 species were also mentioned as being distributed in Borneo.

Since the Flora Malesiana Project began, several pteridophyte families have been treated for the whole Malesian region. Based on this flora, Borneo's pteridophyte richness has been documented by family as: *Lomariopsis* group (Holttum 1978), 24 species; *Tectaria* group (Holttum 1991), 54 species; *Tectaria* group: *Arthropteris* (Hovenkamp and Leonardìa 2012), one species; Polypodiaceae (Hovenkamp et al. 1998), 80 species; Davalliaceae (Nooteboom 1998), 20 species; Azollaceae (Saunders 1998), one species; Cheiropleuriaceae (Laferrière 1998), one species; Equisetaceae (Laferrière 1998), one species; Matoniaceae (Kato 1998), one species; Plagiogyriaceae (Zhang and Nooteboom 1998), 5 species; Thelypteridaceae (Holttum 1981), 94 species; Blechnaceae (Nooteboom et al. 2012), 11 species; Hypodematiaceae (Nooteboom 2012), two species; Monachosoraceae (Nooteboom 2012), one species; Nephrolepidaceae (Hovenkamp and Miyamoto 2012), 7 species; Oleandraceae (Hovenkamp & Ho 2012), three species; Pteridaceae subfam. Parkerioideae (Nooteboom 2012), two species; and the Hymenophyllaceae (Iwatsuki and Ebihara 2023), 62 species.

Moreover, regional accounts, some including checklists, have been produced over the past years. Parris and Latiff (1997) provide a provisional checklist for Malaysia. Popelka et al. (2018) has published on the filmy ferns of Kuala Belalong in Brunei. The most recent checklist from Sabah (Andi Maryani et al. 2022) enumerated 900 species and 26 infraspecific taxa of ferns and lycophytes, with an additional species on Kinabalu by Chen et al. (2023). The pteridological flora of the emblematic Mount Kinabalu had the first attempt in 1934 from Christensen and Holttum, enumerating 417 species. A later checklist increased the total fern and lycophyte flora of Kinabalu to 609 species and 12 infraspecific taxa (Parris et al. 1992). Other checklists or results from expeditions on the island of Borneo reported and gradually contributed to the overall fern flora knowledge. The Mulu National Park checklist (Parris et al. 1984), and those for Bario and Kelabit highlands (Razali et al. 1999), Kalimantan (Bellefroid et al. 2007, Iwatsuki and Kato 1980–1984) are examples. The most up-to-date checklist of vascular plants from Borneo enumerated a total pteridophyte flora of 39 families and 1139 species (Wong 2023).

Brunei Darussalam has a territory of 5,765 km^2, with a gently hilly landscape, and only c. 1% of the territory is considered mountainous, in the most inland part of Temburong district. Nearly 70% of the country's land area is covered with forests. Despite its small land area compared with the other territories, Brunei harbours a much-forested landscape divided into seven categories: mixed dipterocarp forest, mountain forest, heath forest, beach forest, mangrove and brackish water forest, freshwater swamp forest, and peat swamp forest (Wong 1999). This diversity creates a varied forest landscape making Brunei particularly rich in plant diversity compared with its size.

HISTORICAL PERSPECTIVE, APPROACH AND METHODOLOGY

The first person who gave consistent attention to collating material of the ferns of Brunei was Dr. David S. Edwards, who joined the Universiti Brunei Darussalam (UBD) in 1986, its Head of the Biology Department (1987–1993) and subsequently Dean of Science, starting UBD's collections in the fledgling herbarium there (Fig. 1). Dr Edwards also frequented Brunei's main herbarium at the Forestry Department in Sungai Liang (international acronym BRUN). With the geographical coverage and collecting intensity of the Brunei-Kew Checklist project of the late 1980s and early 1990s (this addressed flowering plants and gymnosperms, although pteridophytes were also routinely taken; see Coode et al. 1996), the BRUN herbarium rapidly expanded and was subsequently designated the National Herbarium. In those early years, his attention given to identifying and naming ferns and paying heed to newly emerging revisions was the main curatorial effort on the Brunei material. However, he completed his service with UBD in 2012, and has not been able to continue working on Brunei

Figure 1. Dr. David S. Edwards of Universiti Brunei Darussalam, pioneer in Brunei's fern studies. (Courtesy of the Universiti Brunei Darussalam).

ferns. His imprint is nevertheless clearly present. Further to these efforts, continuing exploration of the Brunei flora in collaboration with the Brunei Forestry Department and the Singapore Botanic Gardens since 2013 and other collectors have continued to add interesting material. The most recent fern species described from Brunei was *Haplopteris palustris* in 2024 (Cheng et al. 2024). Collectors with the highest voucher contribution to the Brunei fern flora are D.S. Edwards 893, R.J. Johns 519, K.M. Wong 268, BRUN numbers 207, D. Cicuzza 142, Mohd. Ariffin 118, J. Dransfield 96, and A.D. Poulsen 78.

The present work aims to contribute to the first Fern and Lycophyte checklist of Brunei Darussalam. Although we do not attempt to assess the conservation status of Brunei fern species according to IUCN criteria (IUCN 2022), which would necessitate many more considerations outside of Brunei itself, we attempt, wherever possible, to include notes on rarity or commonness, as well as distribution, in Brunei.

The checklist, representing the first enumeration of the ferns and lycophytes of Brunei Darussalam, is entirely based on the specimen material deposited in the herbaria of Brunei Darussalam. These are, respectively, the National Herbarium of Brunei Darussalam (BRUN), and the Universiti Brunei Darussalam Herbarium (UBDH). All international research projects conducted in Brunei over the recent years have their reference vouchers lodged with BRUN and UBDH, while duplicates are deposited overseas. Therefore, this checklist should represent the most comprehensive record of the Brunei pteridophyte flora.

For each taxon assessed in this work, we include the species name, most common synonyms, collector name(s), voucher number, and known local distribution. The circumscription of the families and genera mostly followed the PPG I (2016). The nomenclature for each species was checked with the online resources of Plants of the World Online, POWO, Tropicos.org (MBG 2024), IPNI (2024) and Ferns and Lycophytes of the World (2024). For taxa identified at the subspecies or variety levels but not recognised on the international online sources, we consider them only at the species level, leaving these to benefit from better comprehension from further studies. Specimens cited in the manuscript have been physically examined, while images have been shared with experts for name certification.

We use only two categories that attempt to indicate local conservation assessment: Least Concern and Rare. In cases with more information, each indication is augmented with further information about the species abundance. The evaluation for each species is based on the frequency of the herbarium vouchers deposited with BRUN and UBDH and on the authors' first-hand knowledge. When the species had fewer than five duplicates collected within the country, we considered it rare for Brunei. This first attempt will be the basis for future and improved evaluations. The notation 'cf.' is used in instances where very few specimens are of uncertain identity or were initially listed under a name that was subsequently regarded as a synonym of another species. We did not go beyond any attempt to provide further explanation, as this would require a level of taxonomic interpretation beyond the scope of this study.

A note on taxonomic information represented.

This checklist also includes five newly described species by Barbara Parris, and the taxonomic descriptions are presented within the enumeration of the Polypodiaceae. Otherwise, at the same time that we realise this checklist is not a work of taxonomy *per se*, we have made every attempt up to the present time to consult the latest revisions and authoritarian accounts (see references) to adopt the results of both conventional taxonomic and

molecular studies elucidating relationships. It would be well appreciated that these modern studies have recently modified very many taxonomic concepts from previous classifications before the present century. We have omitted any listing of synonymy as this is necessarily related to taxonomic interpretations by various specialists; the only exceptions are very few, pertaining to identifications of Brunei specimens where different names applied are considered by current specialists to refer to the same taxon. We mention these in the specimen listings.

BIOGEOGRAPHICAL CONSIDERATIONS: RICHNESS AND ENDEMISM

Brunei Darussalam is divided into four administrative districts: Kuala Belait (BEL), Brunei Muara (BRM), Temburong (TEM), and Tutong (TUT); these district acronyms are used in the listing of specimens seen throughout the checklist (Fig. 2). Each species reported in this checklist has information related to their distribution for each district for ease of tracing localities. The distribution of each species beyond Brunei is sum-

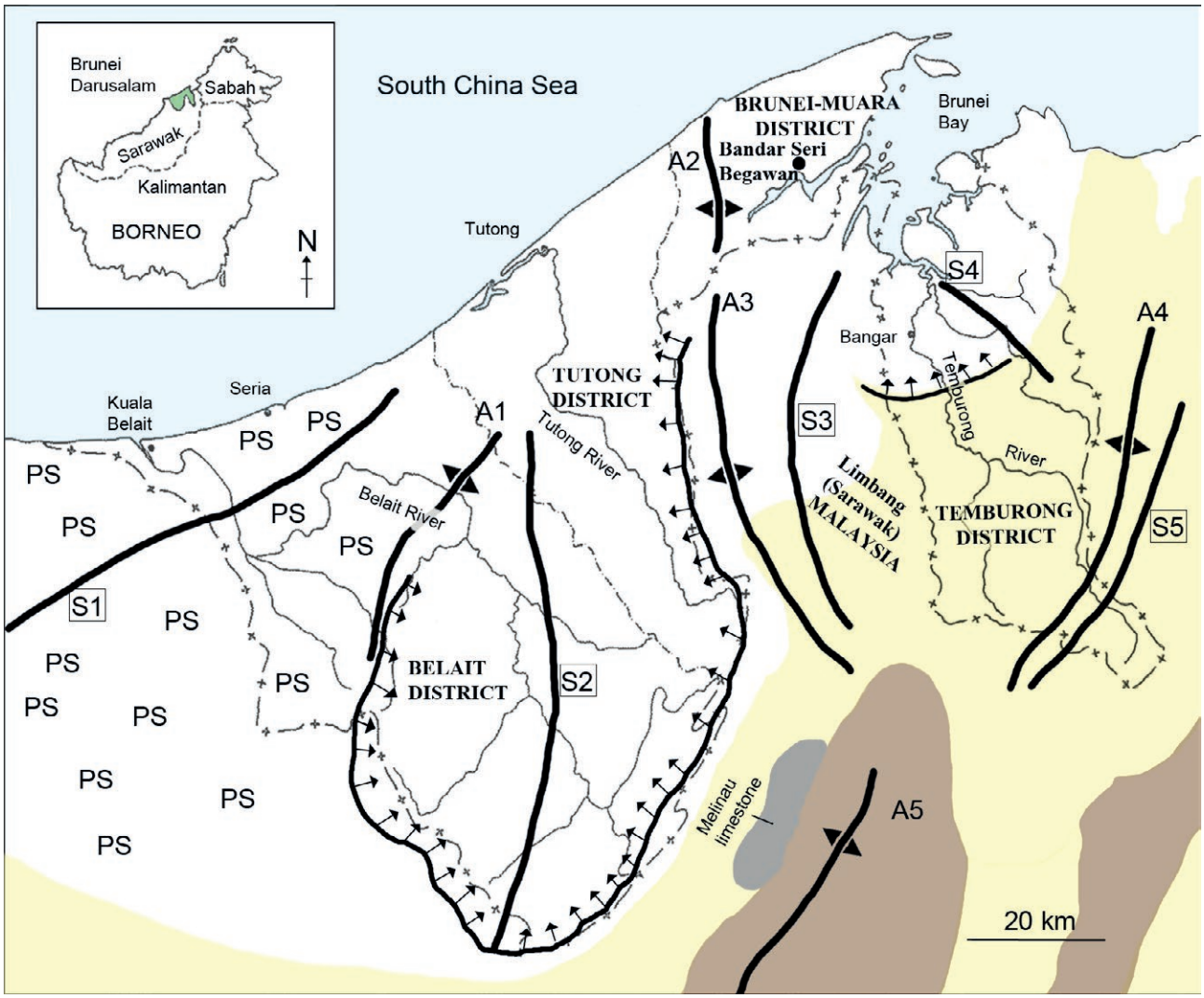

Figure 2. Distinctive geo-ecological features of the Brunei area. *Uncoloured:* Pliocene - Miocene Sediments, in places overlain by Pleistocene or more recent deposits. *Yellow:* Miocene - Oligocene Sediments. *Brown:* Rajang Group Deepwater Sediments (Late Cretaceous - Eocene). *Anticlines:* A1. Belait anticline. A2. Jerudong anticline. A3. Danau anticline. A4. Tangga anticline. A5. Mulu Uplift. *Synclines:* S1. Liku-Badas syncline. S2. Belait syncline. S3. Limbang syncline. S4. Labu syncline. S5. Tangga syncline. Simple line with arrows: Approximate boundary of synclinal basins within Brunei. PS. Peat body or peat swamp vegetation over low-lying ground. (Credit: K.M. Wong & Alsa Moo, from Joffre et al. 2015).

marised from various sources, including Hassler (2021 global), Lindsay & Middleton (2012 onwards, Cambodia, Laos and Thailand), Cámara-Leret et al. (2020, New Guinea), and the Flora Malesiana series (https://floramalesiana.org/).

A total of 1921 vouchers were examined, with 364 species belonging to 106 genera and 32 families (Table 1). Brunei's angiosperm and gymnosperm flora was estimated at close to 3500 species (Wong 1999). Ferns and lycophytes represent some 10% of Brunei's vascular plant flora.

The top five most species-rich families in the country are Polypodiaceae (80 spp.), Pteridaceae (35 spp.), Hymenophyllaceae (32 spp.), Thelypteridaceae (29 spp.), and Lindsaeaceae (24 spp.). With a total of 200 species, they represent 54.9% of the entire pteridophyte flora of Brunei. Polypodiaceae and Thelypteridaceae are some of the most species-rich plant families among pteridophytes in the world, and thus their predominance in the country is also expected. The most species-rich genera for Brunei are *Lindsaea* (20 taxa, Lindsaeaceae), *Selliguea* (16 taxa, Polypodiaceae), *Asplenium* and *Hymenophyllum* (with 15 taxa each, Aspleniaceae and Hymenophyllaceae, respectively), *Selaginella* and *Tectaria* (with 14 taxa each, Selaginellaceae and Tectariaceae, respectively), *Diplazium* (12 taxa, Athyriaceae), and *Haplopteris* (10 taxa, Pteridaceae). Of the 364 species presented, 47 are endemic to Borneo, representing 12.9% of Brunei's pteridophyte flora. Four species, *Calymmodon ashtonii*, *C. minutus*, *Ctenopterella rivularis* and *Tectaria jacobsii*, are endemic to Brunei.

Plant distributions are not expected to follow man-made administrative districts, rather, more so natural attributes such as elevation, terrain, geology, and vegetation types or even drainage. But it should also be realised (Wong 1999) that bigger plants with better-dispersed propagules (e.g., seeds) have, in general, a wider distribution than smaller plants such as forest-floor herbs. On the other hand, wind dispersal, as in the case of many orchids, also generally results in a wider distribution, so within the small land area of Brunei, fewer instances of restriction of plant distribution in this dispersal category may be expected. This would appear to be the case with ferns and lycophytes. Notwithstanding, plant-geographic considerations have identified a 'Brunei area' (including Brunei and adjacent parts of southwest Sabah and northeast Sarawak) as a plant area of special interest, often with its own suite of rare and endemic plants (Ashton 2003, Henrot et al. 2013, Joffre et al. 2015, Wong and Neo 2019).

Table 1. Fern and lycophyte families, genera and the number of species enumerated for Brunei Darussalam; in parentheses, the number of species endemic to Borneo.

GROUP / Family	Genera	Species
A. LYCOPHYTA		
1 Lycopodiaceae	*Huperzia*	2
	Lycopodiastrum	1
	Palhinhaea	1
	Phlegmariurus	5
2 Selaginellaceae	*Selaginella*	14 (7)
B. PTERIDOPHYTA		
3 Aspleniaceae	*Asplenium*	15 (1)
4 Athyriaceae	*Diplazium*	12 (3)
5 Blechnaceae	*Blechnopsis*	2
	Parablechnum	1
	Stenochlaena	1
	Telmatoblechnum	1
6 Cibotiaceae	*Cibotium*	1
7 Cyatheaceae	*Alsophila*	5 (1)
	Sphaeropteris	8 (2)
8 Cystodiaceae	*Cystodium*	1
9 Davalliaceae	*Davallia*	8
	Davallodes	1
10 Dennstaedtiaceae	*Histiopteris*	2
	Microlepia	3
	Pteridium	1
11 Didymochlaenaceae	*Didymochlaena*	1
12 Dipteridaceae	*Cheiropleuria*	1
	Dipteris	4 (1)
13 Dryopteridaceae	*Arachniodes*	2
	Bolbitis	3
	Dryopteris	1
	Elaphoglossum	3
	Pleocnemia	2
	Teratophyllum	3
14 Gleicheniaceae	*Dicranopteris*	2
	Diplopterygium	2 (1)
	Gleichenia	1
	Sticherus	3
15 Hymenophyllaceae	*Abrodictyum*	4
	Cephalomanes	2
	Crepidomanes	5
	Didymoglossum	4
	Hymenophyllum	15
	Trichomanes	1
	Vandenboschia	1
16 Hypodematiaceae	*Leucostegia*	1
17 Lindsaeaceae	*Lindsaea*	20 (1)
	Tapeinidium	4 (1)
18 Lomariopsidaceae	*Cyclopeltis*	1
	Lomariopsis	2
19 Lygodiaceae	*Lygodium*	4

(Continued)

Table 1. (Continued).

GROUP / Family	Genera	Species
20 Marattiaceae	*Angiopteris*	3
	Christensenia	1
	Ptisana	1
21 Matoniaceae	*Matonia*	1
22 Nephrolepidaceae	*Nephrolepis*	5
23 Oleandraceae	*Oleandra*	3 (1)
24 Ophioglossaceae	*Helmintostachys*	1
	Ophioglossum	4
25 Plagiogyriaceae	*Plagiogyria*	1
26 Polypodiaceae	*Acrosorus*	2 (1)
	Calymmodon	5 (3)
	Ctenopterella	2 (1)
	Dasygrammitis	1
	Drynaria	3
	Glabrigrammitis	1
	Goniophlebium	2
	Lecanopteris	3
	Lepisorus	6
	Leptochilus	2
	Loxogramme	3
	Microsorum	7
	Oreogrammitis	7 (3)
	Platycerium	2
	Prosaptia	4
	Pyrrosia	6 (1)
	Scleroglossum	4 (1)
	Selliguea	16 (4)
	Thylacopteris	1
	Tomophyllum	2
	Xiphopterella	1 (1)
27 Psilotaceae	*Psilotum*	2
28 Pteridaceae	*Acrostichum*	2
	Antrophyum	3
	Ceratopteris	1
	Cheilanthes	1
	Haplopteris	10 (1)
	Mickelopteris	1
	Pityrogramma	1
	Pteris	6 (1)
	Syngramma	5 (1)
	Taenitis	4 (1)
	Vaginularia	1
29 Saccolomataceae	*Saccoloma*	1
30 Schizaeaceae	*Actinostachys*	2
	Schizaea	2
31 Tectariaceae	*Draconopteris*	1
	Polydictyum	1 (1)
	Tectaria	14 (3)
32 Thelypteridaceae	*Abacopteris*	1
	Amblovenatum	2
	Chingia	1
	Christella	2
	Coryphopteris	1
	Cyclosorus	1
	Grypothrix	3
	Macrothelypteris	1
	Mesophlebion	7 (3)
	Plesioneuron	1 (1)
	Pronephrium	2
	Sphaerostephanos	7 (1)

ENUMERATION OF TAXA

LYCOPHYTA

Family 1. LYCOPODIACEAE

1.1. Huperzia Bernh., J. Bot. (Schrader) 1800(2): 16. 1801.

Huperzia ceylanica (Spring) Rothm., Feddes Repert. Spec. Nov. Regni Veg. 54: 59. 1951.

TEM: Bkt Retak, *Edwards 820*.

Distribution. From India and Sri Lanka to Java and Brunei.

Ecology. In mature forests. Threat: Least Concern.

Huperzia serrata (Thumb.) Trevis., Atti Soc. Ital. Sci. Nat. 17: 247–248. 1875.

TEM: G Pagon, *Wong WKM1900*, *Booth P39*.

Distribution. Pantropical.

Ecology. In tropical montane forests. Threat: Rare in Brunei.

1.2. Lycopodiastrum Holub ex R.D.Dixit, J. Bombay Nat. Hist. Soc. 77: 540. 1980.

Lycopodiastrum casuarinoides (Spring) Holub ex R.D.Dixit, J. Bombay Nat. Hist. Soc. 77: 541. 1981.

TEM: Bkt Retak, *Wong WKM428*; G Pagon, *Booth P25*.

Distribution. From India, Eastern China, and Japan, to New Guinea.

Ecology. In mature tropical forests. Threat: Least Concern.

1.3. Palhinhaea Franco & Carv., Bol. Soc. Brot., ser. 2, 41: 24. 1967.

Palhinhaea cernua (L.) Franco & Vasc., Bol. Soc. Brot., sér. 2, 41: 25. 1967. (Fig. 3).

BEL: Wasai Wong Kadir, *Edwards 2557*; Sg Mendaram, *Ariffin et al. BRUN22801*; Sg Mendaram, *Ariffin et al. BRUN22802*; Luagan Lalak, *Forman LLF859*. **BRM:** Tasek Lama, *Goh s.n.*; Tasek Lama, *Naqibah s.n.*; Tasek Gorge, *Edwards 408*; Serasa, *Ariffin et al. BRUN23887*. **TEM**: Bkt Belalong, *Edwards & Cantley 808*; G Pagon, *Booth P25*, *Ashton A209*, *Ashton A224*; Belalong, FSC, *Tagane B378*; Bkt Gelagas, *Simpson 2312*; Bkt Retak, *Wong WKM431*; Batu Apoi, *Poulsen ADP356*. **TUT**: Benutan Lake, *Edwards 2331*; Tasek Merimbun, *Bernstein JHB125*.

Distribution. Pantropical.

Ecology. Forest margins and areas with minimal disturbance. Threat: Least Concern.

1.4. Phlegmariurus (Herter) Holub, Preslia 36: 17, 21. 1964.

Phlegmariurus cf. ***gnidioides*** (L.f.) A.R.Field & Bostock, PhytoKeys 20: 40. 2013.

TEM: Bkt Patoi, *Edwards 2268*.

Distribution. Southern Africa, West Indian Ocean Islands, and Brunei.

Ecology. In mature forests. Threat: Least Concern.

Phlegmariurus nummulariifolius (Blume) Ching, Acta Bot. Yunnan. 3: 298. 1981.

TEM: Bkt Belalong, *Sands MS5554*; Sg Temburong, FSC, *Wong WKM1229*, *Boyce 393*; Sg Belalong, *Ashton A101*. **TUT**: Sg Rambai, *Ariffin et al. BRUN17588*.

Distribution. Indochina, Malaysia (Malay Peninsula, Sabah, Sarawak), Brunei, Indonesia (Java, Kalimantan, Maluku), Philippines, New Guinea to Fiji.

Ecology. In primary and secondary forests. Threat: Least Concern.

Phlegmariurus phlegmaria (L.) T.Sen & U.Sen, Fern Gaz. 11(6): 421. 1978. (Fig. 4).

BEL: Lamunin, Pipeline, *Edwards 957*; Batu Melintang, Sg Ingei, *Wong WKM627*; Belait river, Melilas, *Forman LLF1144*; Badas Peat Swamp, *Wong WKM180*; Labi hill, *Cicuzza 2688*. **TEM**: Bkt Patoi, *De Vogel 8904*, *Edwards 2269*, *Poulsen ADP148*; Sg Dolhakim, *Edwards 557*; Bkt Retak, *Wong WKM784*; Belalong, FSC, *Wong WKM1237*, *Wong WKM257*, *Xia 3*; Kpg Bakok, *Cicuzza 2716*; Belalong FSC, *Tagane B378*. **TUT**: Sg Apam, Ulu Tutong, *Edwards 2404*; Sg Medit, *Simpson 2516*; Near Pipeline, *Edwards 957*.

Figure 3. Lycopodiaceae. *Palhinhaea cernua* (Photo KM. Wong).

Figure 4. Lycopodiaceae. *Phlegmariurus phlegmaria* (Photo KM. Wong).

Distribution. Old World tropics from Africa and Asia to the Pacific Islands.

Ecology. In mature forests. Threat: Least Concern.

Phlegmariurus pinifolius (Trevis.) Kiew, PhytoKeys 96: 108. 2018.

TEM: Batu Apoi, *Simpson 2288*.

Distribution. Sri Lanka, Malaysia (Malay Peninsula, Sarawak, Sabah), Brunei, Indonesia (Sumatra, Java, Lesser Sunda Islands, Kalimantan, Sulawesi, Maluku), Philippines, New Guinea.

Ecology. In mature forests. Threat: Least Concern.

Phlegmariurus squarrosus (G.Forst.) Á.Löve & D.Löve, Taxon 26: 324. 1977.

TEM: K Belalong, FSC, *Wong WKM277*; Batu Apoi, *Poulsen ADP198*. **TUT**: Benutam dam, Ladan hill, *Edwards 956*.

Distribution. West Indian Ocean Islands, Sri Lanka, India, Nepal, Bangladesh, China, Thailand, throughut Malesia to Australia and the Pacific Islands.

Ecology. In mature forests. Threat: Least Concern.

Family 2. SELAGINELLACEAE

2.1. Selaginella P.Beauv., Mag. Encycl. 9(5): 478. 1804, *nom. cons.*

Many of the *Selaginella* recorded from Brunei have very few collections, with the exception of the commoner species. Such low records can be the attributed to species rarity, or that botanists have overlooked this family when collecting specimens. As a result, many species have been assessed as Rare in Brunei; however, more studies are needed to provide better conservation status evaluations of these species.

Selaginella alopecuroides Baker, J. Bot. 19: 368, no. 83. 1881.

TEM: Batu Apoi, *Samhan SN10*. **TUT**: Benutan Lake, *Edwards 2337*; Ladan Hill, *Edwards 948*; Sg Apan, *Edwards 2406*.

Distribution. Endemic to Borneo (Brunei, Kalimantan, Sarawak).

Ecology. A forest species found in humid sites and close to water. Threat: Rare in Brunei.

Selaginella boschai Hieron., Hedwigia 51: 243, no. 2. 1912.

BRM: Kpg Dadap, *Edwards 2410*, *Edwards 2414*.

Distribution. Endemic to Borneo (Brunei, Sabah, Sarawak).

Ecology. A forest species found in humid sites and close to streams. Threat: Rare in Brunei, possibly overlooked in similar habitats.

Selaginella delicatula (Desv. ex Poir.) Alston, J. Bot. 70: 282. 1932.

TEM: Amo, Belalong, FSC, *Cicuzza 2598*.

Distribution. India to Maluku, doubtfully in tropical America.

Ecology. A forest species found in humid sites and close to water. Threat: Rare in Brunei.

Selaginella dielsii Hieron., Hedwigia 51: 254, no. 7. 1912.

BRM: Lumapas, Kpg Dadap, *Edwards 2411*.

Distribution. Endemic to Borneo (Brunei, Sabah, Sarawak).

Ecology. In pristine lowland forests. Threat: Rare in Brunei.

Selaginella hewittii Hieron., Hedwigia 51: 262, no. 12. 1912.

TEM: Belalong, FSC, Sg Baki, *Edwards 2296*.

Distribution. Endemic to Borneo (Brunei, Sabah, Sarawak).

Ecology. In pristine forests. Threat: Rare in Brunei.

Selaginella intermedia (Blume) Spring, Bull. Acad. Roy. Sci. Bruxelles 10: 144. 1843.

(=) *Selaginella atroviridis* (Wall. ex Hook. & Grev.) Spring, Flora 21: 183. 1838.

BEL: Labi, Sg Teraja, *Edwards 2534*; Melilas, Sg Ingei, *Wong WKM664*; Melilas, Ulu Ingei, *Wong WKM s.n.*; Sg Ingei, upstream, *Edwards 2377*; Sg Liang, *Edwards 489*. **BRM**: Jln Sg Akar, *Edwards 444*. **TEM**: Bkt Belalong, *Edwards 815*.

Distribution. India, Myanmar, throughout Malesia.

Ecology. In pristine forests, along streams. Threat: Least Concern.

Selaginella involvens (Sw.) Spring, Bull. Acad. Roy. Sci. Bruxelles 10(1): 136. 1843. (Fig. 5).

TEM: Amo, Kerangan Meritam, *Hussain et al. BRUN15676*; Amo, Sg Temburong, *Wong WKM1718*; Amo, Sg Belalong (Amo), *Wong WKM1339*; Amo, K Belalong, *Dransfield SD1002*; Amo, K Belalong, *Dransfield SD990*; Amo, Sg Temburong, *Wong WKM460*; Batu Apoi, *Samhan SN9*.

Distribution. Sri Lanka, India, China, Korea, Japan, Indochina, Malaysia (Sabah, Sarawak), Brunei, Indonesia (Lesser Sunda Islands, Kalimantan, Sulawesi, Maluku).

Figure 5. Selaginellaceae. *Selaginella involvens* (Photo KM. Wong).

Ecology. In pristine lowland forests to 1200 m a.s.l. Threat: Least Concern.

Selaginella lobbii Veitch ex A.Braun., Index Sem. Hort. Berol. 20. 1858.

TEM: Sg Belalong, *Edwards 938*; Batu Apoi, *Edwards 2447*.

Distribution. Endemic to Borneo (Brunei, Kalimantan, Sarawak).

Ecology. In pristine forests. Threat: Rare in Brunei.

Selaginella longiaristata Hieron., Hedwigia 50: 16. 1910.

BRM: Lumapas, Kpg Dadap, *Edwards 2412*.

Distribution. Endemic to Borneo (Brunei, Kalimantan, Sabah, Sarawak).

Ecology. In pristine lowland forests. Threat: Rare in Brunei.

Selaginella plana (Desv. ex Poir.) Hieron., Nat. Pflanzenfam. [Engler & Prantl] 1(4): 703. 1901.

BRM: Jln Sg Akar, *Edwards 443*.

Distribution. Malay Peninsula, Brunei, Indonesia (Sumatra, Java, Lesser Sunda Islands, Sulawesi, Maluku), widely naturalised in tropical and subtropical regions.

Ecology. In pristine forests. Threat: Rare in Brunei.

Selaginella subserpentina Alderw., Bull. Jard. Bot. Buitenzorg 2, 1: 17. 1911.
TEM: Amo, Batu Apoi FR (K Belalong FSC), *Poulsen ADP98*.

Distribution. Endemic to Borneo (Brunei, Sarawak).

Ecology. In pristine lowland forests. Threat: Rare in Brunei.

Selaginella tamariscina (P.Beauv.) Spring, Bull. Acad. Roy. Sci. Bruxelles 10(1): 136. 1843.

TEM: Sg Sitam, FSC, *Edwards 2017*.

Distribution. India, China, Japan, North and South Korea, Thailand, Malaysia (Sabah), Brunei, Indonesia (Java, Lesser Sunda Islands, Sulawesi), Philippines.

Ecology. In pristine forests. Threat: Rare in Brunei.

Selaginella wallichii (Hook. & Grev.) Spring, Fl. Bras. (Martius) 1(2): 124. 1840.

BRM: Jln Sg Akar, *Edwards 518*.

Distribution. China, Indochina, Malaysia (Malay Peninsula, Sabah), Brunei, Indonesia (Sumatra, Indonesian New Guinea).

Ecology. In pristine forests. Threat: Rare in Brunei.

Selaginella willdenowii (Desv. ex Poir.) Baker, Gard. Chron. 783. 1867.

TEM: Bangar, Sg Temburong, *Edwards 496*.

Distribution. India, China, Indochina, Malay Peninsula, Indonesia (Sumatra, Java), the Philippines, widely naturalised in tropical regions.

Ecology. In pristine forests. Threat: Rare in Brunei.

PTERIDOPHYTA

Family 3. ASPLENIACEAE

3.1. Asplenium L., Sp. Pl.: 1078. 1753.

Asplenium affine Sw., J. Bot. (Schrader) 1800(2): 56. 1801.

BEL: K Belait, Sg Belait, *Edwards 2417*. **TEM**: Batu Apoi, Bkt Gelagas (Bkt Suang), *Simpson 2421*; Amo, Batu Apoi FR (K Belalong), *Hansen CH1619*; Amo, Sg Temburong, *Johns RJ7391*, *Edwards*

2130; Amo, Batu Apoi FR (K Belalong FSC), *Edwards 2074*; Sg Sitam, FSC, *Edwards 996*; Sg Belalong & Sg Esu, FSC, *Edwards 2198*.

Distribution. West Indian Ocean Islands, Sri Lanka, India, China, Indochina, throughout Malesia to Australia and Fiji.

Ecology. It is found in mature forests in muddy soil and humid places; abundant along slopes from the lowlands to 1500 m a.s.l. Threat: Least Concern. Notes: This species is widely distributed in the old-world tropics and displays a wide morphological variability; and is considered as a particularly complex species (Philcox 2006).

Asplenium anguineum Christ, J. Bot. (Morot), sér. 2, 1: 232, 265. 1908.

BEL: Sukang, Buau-Sindum, *Idris et al. BRUN18619*; Melilas, Ulu Ingei, *Idris et al. BRUN17318*, *Sands MS5923*; Labi, Wasai Mendaram, *Johns RJ6810*; Labi, Labi, *Johns RJ6833*, *Johns RJ6897*; K Belait, Sg Belait, *Dransfield SD1140*. **TEM**: Amo, Bkt Belalong, *Johns RJ7003*; Amo, Ulu Belalong LP382, *Idris et al. BRUN16690*; Bangar, Bkt Bangar, *Johns RJ7044*; Amo, K Belalong, *Ashton A14*; Amo, Batu Apoi FR (K Belalong FSC), *Edwards 2095*, *Edwards 2040*, *Hansen CH1528*, *Poulsen ADP146*; Batu Apoi, Sg Selapon, *Wong WKM2038*; Batu Apoi, Bkt Gelagas (Bkt Suang), *Simpson 2330*, *Simpson 2325*; Amo, Sg Temburong, *Johns RJ7351*, *Johns RJ6952*, *Johns RJ7236*; Batu Apoi, Kpg Selapon, *Dransfield SD1158*; Amo, Kerangan Meritam, *Hussain et al. BRUN15675*. **TUT**: Rambai, Sg Tutong (Belabau), *Coode MC6345*; Rambai, Sg Medit, *Simpson 2588*; Rambai, Ulu Tutong, *Johns RJ7558*, *Johns RJ7644*; Lamunin, Ladan Hills FR, *Johns RJ7094*.

Distribution. From South China to New Guinea.

Ecology. In shade forest, along rivers, streams or in humid sites; lowlands to 1000 m a.s.l. Threat: Least Concern.

Asplenium borneense Hook., Sp. Fil. 3: 138 t–186. 1860.

TEM: Amo, Bkt Retak, *Johns RJ6679*.

Distribution. Malaysia (Malay Peninsula, Sarawak, Sabah), Brunei, Indonesia (Sumatra, Kalimantan).

Ecology. In mature forest, from lowland to submontane forest. Threat: Rare in Brunei.

Asplenium colubrinum Christ, Bull. Herb. Boissier II(6): 999. 1906.

TEM: Labu, Peradayan FR, *Johns RJ7049*; Amo, Batu Apoi FR; *Johns RJ6932*; Amo, Bkt Retak; *Johns RJ6614*; Labu, Peradayan FR, *Johns RJ7050*.

Distribution. Malaysia (Sarawak, Sabah), Brunei, Philippines.

Ecology. Terrestrial, in mature forest; lowlands to 1000 m a.s.l. Threat: Rare in Brunei.

Asplenium longissimum Blume, Enum. Pl. Javae 2: 178. 1828. (Fig. 6).

(=) *Asplenium anisodontum* C.Presl, Epimel. Bot. 73. 1851.

TEM: Amo, Belalong, KBFSC, *Cicuzza 2722*. **TUT**: Telisai, Kpg Telamba, *Ariffin et al. BRUN20766*; Ukong, Kpg Sg Damit, *Ariffin et al. BRUN20439*; Kago dam, *Cicuzza 2646*; Labi hill, *Cicuzza 2684*.

Distribution. India, Bangladesh, the Chagos Islands, Indochina, Malaysia (Malay Peninsula, Sarawak), Brunei, Indonesia (Java, Sulawesi, Lesser Sunda Islands), Philippines.

Ecology. In dry places; lowlands to 2000 m a.s.l. Threat: Least Concern.

Asplenium cf. ***longissimum*** Blume

TEM: Amo, Bkt Retak, *Johns RJ6626*.

Asplenium macrophyllum Sw., J. Bot. (Schrader) 1800(2): 52. 1801.

TEM: Sg Dolhakim, *Edwards 574*.

Figure 6. Aspleniaceae. *Asplenium longissimum* (Photo D. Cicuzza).

Distribution. Cameroon, West Indian Ocean Islands, Indochina, Malaysia (Malay Peninsula, Sarawak, Sabah), Brunei, Indonesia (Sumatra, Lesser Sunda Islands, Kalimantan, Maluku), Philippines, New Guinea, to Polynesia.

Ecology. Along rivers in mature forest. Threat: Rare in Brunei.

Asplenium nidus L., Sp. Pl. 2: 1079. 1753. (Fig. 7).

BEL: Labi, Wasai Wong Kadir, *Johns RJ7445*. Labi, Bkt Teraja, *Johns RJ6890*. **BRM**: Serasa, Meragang Beach, *Idris et al. BRUN17363*; P Punyit, *Wong & Kamariah s.n.*; Sg Akar, *Edwards* 439. **TEM**: Bangar, Bkt Bangar, *Johns RJ7035*, *Johns RJ7046*; Bangar, Bkt Biang, *Forman LLF925*; Amo, Batu Apoi FR (K Belalong FSC), *Wong WKM1321*; Amo, Batu Apoi FR (K Belalong FSC), *Hansen CH1512*; Amo, Sg Temburong, *Johns RJ6943*; Amo, K Belalong, *Wong WKM1* **TUT**: Rambai, Tasek Merimbun, *Suzuki K13056*. Rambai, Tasek Merimbun, *Johns RJ7468*; Lamunin, *Edwards 968*; Merimbun lake, *Cicuzza 2553*.

Distribution. Old World Tropics.

Ecology. In secondary forests, plantations, and parks; a common species in Southeast Asia. Threat: Least Concern.

Asplenium nitidum Sw., Syn. Fil. (Swartz): 84, 280. 1806. (Fig. 8).

BEL: Melilas, Sg Ingei, *Wong WKM666*; Sg Teraja, *Edwards 704*; Sg Belait, *Edwards 2417*, Labi Hill, *Cicuzza 2685*. **BRM**: Mentiri, Kpg Mentiri; *Edwards 669*. **TEM**: Amo, K Belalong FSC, *Dransfield SD1012*; Batu Apoi, Sg Selapon, *Wong WKM2040*; Batu Apoi, Selapon (Bkt Beliton), *Wong WKM2061*; Bkt Patoi, *Edwards 2256*. **TUT**: Benutan lake, *Edwards 2227*.

Distribution. Sri Lanka, India, Himalaya (Nepal to Assam), Indochina, Sumatra, Malaysia (Malay Peninsula, Sarawak, Sabah), Brunei.

Ecology. Epiphytic, sometimes lithophytic; in Brunei, found from coastal forest to 1000 m a.s.l. Threat: Least Concern.

Asplenium pellucidum Lam., Encycl. 2: 305. 1786.

TEM: Amo, K Belalong FSC, *Middleton DJM772*, *Edwards 2170*, *Edwards 2065*, *Edwards 995*, *Wong WKM1316*; Amo, Sg Temburong; *Johns RJ7281*, *Johns RJ7199*; Amo, Sg Belalong, *Johns RJ6997*, Amo, Sg Belalong, *Cicuzza 2608*. **TUT**: Merimbun Lake, *Cicuzza 2546*.

Distribution. Old World Tropics.

Figure 7. Aspleniaceae. *Asplenium nidus* (Photo D. Cicuzza).

Figure 8. Aspleniaceae. *Asplenium nitidum* (Photo D. Cicuzza).

Ecology. In open forest and shrubby areas; lowlands to 1100 m a.s.l. Threat: Least Concern.

Asplenium phyllitidis D.Don, Prodr. Fl. Nepal. 7. 125. 1825.

TEM: Amo, Bkt Retak, *Wong WKM916*; Belalong, MDF, *Cicuzza 2580*. **TUT**: Lamunin, Kpg Lamunin, *Edwards 968*; Amo, FSC, *Tagane B567*; Sg Engkiang, FSC, *Edwards 2095*; Sg Sitam FSC, *Edwards 2040*; Merimbun lake, *Cicuzza 2552*.

Distribution. India, Nepal, China, Indochina, throughout Malesia, West Pacific Islands.

Ecology. Epiphytic in mature tropical forests, usually in humid sites; lowlands to 1100 m a.s.l. Threat: Least concern.

Asplenium salignum Blume, Enum. Pl. Javae 2: 175. 1828. (Fig. 9).

TEM: Amo, Sg Belalong, *Edwards 2134, Edwards 2126*; Amo, Batu Apoi FR (K Belalong FSC), *Edwards 2181*, *Edwards 2002*; Amo, Sg Belalong (Amo); *Edwards 2126*; Sg Motong, Batu Apoi, *Samhan SN16*; Sg Baki FSC, *Edwards 2293*; Sg Sitam FSC, *Edwards 2039*.

Distribution. China, Indochina, Malaysia (Malay Peninsula, Sarawak, Sabah), Brunei, Indonesia (Sumatra, Java, Kalimantan, Maluku).

Ecology. In evergreen forest to 1500 m a.s.l. Threat: Least Concern.

Asplenium scolopendrioides J.Sm., J. Bot. (Hooker) 3: 408 (nomen). 1841; J.Sm. ex Hook, Hooker's Icon. Pl. t. 930. 1854.

BEL: Labi, Labi Hills FR (Compt 12), *Ariffin et al. BRUN21312*; Labi, Sg Teraja, *Edwards 796*. **TEM**: Amo, Bkt Belalong, *Johns RJ7009*; Sg Motong, Batu Apoi, *Samhan SN13*.

Distribution. Malaysia (Malay Peninsula, Sarawak, Sabah), Brunei, Indonesia (Kalimantan), Philippines.

Ecology. In deep shade, either in mixed dipterocarp forest or on limestone, to 1500 m a.s.l. Threat: Rare in Brunei.

Asplenium tenerum G.Forst., Fl. Ins. Austr. 80. 1786. (Fig. 10).

BEL: Melilas, Sg Ingei, *Wong WKM631*. Melilas, Sg Ingei, *Edwards 2355*; Labi, Sg Teraja, *Edwards 701*. **TEM**: *Dransfield SD993*, *Dran-*

Figure 9. Aspleniaceae. *Asplenium salignum* (Photo KM. Wong).

Figure 10. Aspleniaceae. *Asplenium tenerum* (Photo D. Cicuzza).

sfield SD989; Amo, Bkt Retak, *Wong WKM843*, *Johns RJ6714*, *Johns RJ6678*; Amo, Sg Temburong, *Johns RJ7200*; *Johns RJ7226*, *Idris et al. BRUN15603*; Amo, Sg Belalong, *Johns RJ6953*; Amo, Batu Apoi FR (K Belalong FSC), *Hansen CH1618*; *Lee 1040*; Amo, Bkt Retak, *Johns RJ6621*; Amo, Sg Belalong, *Middleton DJM747*; Amo, Sg Sibut, *Johns RJ6904*; Batu Apoi, Sg Temburong (Headwaters), *Wong WKM1961*; Batu Apoi, Sg Selapon, *Wong WKM2042*; Batu Apoi, Bkt Gelagas (Bkt Suang), *Simpson 2331*, *Simpson 2329*, *Simpson 2496*; Amo, Batu Apoi FR (K Belalong FSC), *Edwards 994*, *Edwards 2007*, *Edwards 2187*; Amo, Sg Belalong, *Edwards 2137*; Amo, Batu Apoi FR, *Poulsen ADP259*, *Poulsen ADP266*; Amo, G Pagon Periok, *Ashton A476*; Amo, Bkt Belalong, *Johns RJ7018*; Amo, Sg Temburong, *Johns RJ6931*; Amo, K Belalong, *Ashton A51*, *Ashton A34*; Amo, Belalong ridge, *De Vogel 8934*; Amo, FSC, *Tagane B495*; Batu Apoi, *Wong WKM278*; Amo, Belalong, FSC, *Cicuzza 2518*; Amo, Sg Belalong, *Cicuzza 2629*; Amo, Sg Belalong, *Cicuzza 2732*. **TUT**: Rambai, Ulu Tutong, *Johns RJ7548*.

Distribution. Sri Lanka, India, China, Japan, Indochina throughout Malesia to the Pacific Islands.
Ecology. Epiphytic, sometimes lithophytic; lowlands to 1500 m a.s.l. Threat: Least Concern.

Asplenium trifoliatum Copel., Philipp. J. Sci., C. 5: 284. 1910.

TEM: Sg Baki FSC, *Edwards 2298*; Sg Baki FSC, *Edwards 2146*; Sibut river, *Johns RJ6904*; Sg Temburong, *Wong WKM1961*.

Distribution. Endemic to Borneo (Brunei, Kalimantan, Sabah).

Ecology. Lithophyte in lowland mature forests. Threat: Rare in Brunei.

Asplenium vittaeforme Cav., Descr. Pl. 255. 1802.

(=) *Asplenium squamulatum* Blume, Enum. Pl. Javae 2: 174. 1828.

TEM: Amo, Bkt Belalong, *De Vogel 9020*; Belalong river, *Wong WKM1333*; *Dransfield SD988*.

Distribution. Thailand, Malaysia (Malay Peninsula, Sarawak, Sabah), Brunei, Indonesia (Sumatra, Java, Kalimantan, Indonesian New Guinea), Philippines.

Ecology. Lithophyte, in dense forests from the lowlands to lower montane forests. Threat: Least Concern.

Asplenium cf. ***vittaeforme*** Cav.

TEM: Amo, K Belalong, *Dransfield SD979*, *Dransfield SD988*; Amo, K Belalong, *De Vogel 8929*, *Wong WKM281*; Amo, Sg Temburong, *Wong WKM1333*.

Family 4. ATHYRIACEAE

4.1. Diplazium Sw., J. Bot (Schrader) 1800(2): 4, 61. 1801.

Diplazium cordifolium Blume, Enum. Pl. Javae 2: 190. 1828.

BEL: Labi, Kpg Labi, *Ariffin ARK70*; Melilas, Batu Melintang, *Kessler PK389*; Pipeline road, Belait, *Edwards 980*. **TEM**: Amo, Batu Apoi FR (K Belalong FSC), *Edwards 2054*; Amo, Batu Apoi FR (K Belalong FSC), *Poulsen ADP203*; Amo, Sg Belalong (Amo), *Edwards 2099*; Amo, Sg Belalong (Amo), *Wong WKM1158*; Amo, Batu Apoi FR (K Belalong), *Poulsen ADP144*; Amo, Bkt Retak, *Johns RJ6741*; Amo, Bkt Retak, *Johns RJ6709*; Amo, Sg Sibut, *Johns RJ6907*; Amo, Sg Belalong (Amo), *Middleton DJM763*; Bangar, Pekan Bangar, *Ashton A85*; Batu Apoi, Bkt Gelagas (Bkt Suang), *Simpson 2443*; Labu, Bkt Patoi (Peradayan FR), *Edwards 925*; Amo, Ulu Temburong, *Ariffin et al. BRUN15747*; Amo, Bkt Retak, *Johns RJ6622*; Sg Temburong, FSC, *Hovenkamp BR001*; Amo, FSC, *Tagane B269*; Sg Sitam FSC, *Edwards 2025*; Sg Sitam FSC, *Edwards 991*; Sg Sitam FSC, *Edwards 2020*; G Pagon, *Booth P18*; Amo, G Pagon, *Liaw 45*; Amo, Belalong FSC, *Cicuzza 2639*. **TUT**: Lamunin, Benutan dam, *Edwards 930*; Benutan Lake, *Edwards 2335*; Benutan Lake, *Edwards 2243*; Benutan Lake, *Edwards 2225*; Benutan Lake, *Edwards 930*; Lamunin, water tower, *Edwards 745*.

Distribution. Indochina, throughout Malesia to the Solomon Islands and Australia.

Ecology. In mature forest, usually in shady habitats; common but at low densities; lowlands to 1500 m a.s.l. Threat: Least Concern.

Diplazium dilatatum Blume, Enum. Pl. Javae 2: 194. 1828.

TEM: Sg Belalong, FSC, *Edwards 2390*; Sg Babi, FSC, *Edwards 2145*; Sg Enkiang, FSC, *Edwards 2049*; Sg Belalong, FSC, *Edwards 2106*; Amo, Belalong, FSC, *Hovenkamp BR013*.

Distribution. Sri Lanka, India, China, Japan, Indochina, throughout Malesia to the Solomon Islands and Australia.

Ecology. Lowlands, in mature tropical forest and old secondary forest. Threat: Least Concern.

Diplazium esculentum (Retz.) Sw., J. Bot. (Schrader) 1801(2): 312. 1803. (Fig. 11).

BEL: Bkt Sawat, Bkt Sawat, *Azlan et al. BRUN22303*; Labi, Sg Teraja, *Edwards 2536*. **BRM**: *Qawi s.n.* **TEM**: Obud dam, *Edwards 2391*; Batu Apoi, Belalong, *Poulsen ADP144*.

Distribution: India, Sri Lanka, China, Japan, Indochina, throughout Malesia to the Pacific Islands, widely naturalised.

Ecology. Common at forest margins and abundant in plantations and farms, usually cultivated; lowlands to 1000 m a.s.l. Threat: Least Concern.

Figure 11. Athyriaceae. *Diplazium esculentum* (Photo D. Cicuzza).

Notes

One of the most common edible ferns in Southeast Asia.

Diplazium fraxinifolium C.Presl, Reliq. Haenk. 1(1): 49. 1825.

Athyrium riparium (Holttum) Holttum, Rev. Fl. Malaya 2: 554 (1955 ['1954']).
Diplazium riparium Holttum, Gard. Bull. Straits Settlem. 11(2): 97 (1940); Holttum, Rev. Fl. Malaya, ed. 2, 2: 637 (1968).

BEL: Labi, Sg Teraja, *Edwards 2537*; Arboretum Sg Liang, *Edwards 478*; Labi, Sg Teraja, *Edwards 762*; Labi, Sg Teraja, *Edwards 795*; Labi, Labi Hills FR (Compt 12), *Ariffin et al. BRUN21319*; Labi, Labi Hills FR (Compt 12), *Ariffin et al. BRUN21445*. **TEM**: Sg Temburong FSC area, *Edwards 2156*; Sg Temburong, FSC area, *Edwards 2190*; Sg Sitam, FSC, *Edwards 2026*; Sg Babi, FSC, *Edwards 2151*; Bkt Patoi, *Edwards 888*; Sg Belalong FSC, *Edwards 2086*; Amo, Batu Apoi FR (K Belalong FSC), *Poulsen ADP123*; Amo, Batu Apoi FR (K Belalong FSC), *Edwards 2180*; Batu Apoi, Bkt Gelagas (Bkt Suang), *Simpson 2460*; Amo, Batu Apoi, *Ariffin et al. BRUN23437*; Amo, Batu Apoi, *Hovenkamp BR011*, *Hovenkamp BR004*; Amo, Belalong FSC, *Cicuzza 2633*; Kpg Bakok, *Cicuzza 2712*.

Distribution. India, Brunei, Indonesia (Java, Kalimantan), Philippines, New Guinea.

Ecology. In primary lowland forest on wet soil and close to streams. Threat: Least Concern.

Diplazium holttumii Hovenkamp, Gard. Bull. Singapore 71(1): 62. 2019.
BEL: Liang, Andulau FR (Sg Liang), *Edwards 905*. **TEM**: Amo, FSC, *Tagane B61*; Amo, Bkt Retak, *Johns RJ6618*; Batu Apoi, Belalong, *Poulsen ADP348*.

Distribution. Indochina, Malaysia (Malay Peninsula, Sarawak, Sabah), Brunei, Indonesia (Sumatra, Kalimantan, Maluku).

Ecology. In lower montane forests, along trails and on well-drained soil. Threat: Least Concern, but not frequent in Brunei.

Diplazium hottae Tagawa, Acta Phytotax. Geobot. 25(2–3): 65. 1972.

BEL: Kpg Mendaram, *Ariffin et al. BRUN23455*; Kpg Rampayoh, *Ariffin et al. BRUN23690*. **TEM**: Amo, Bkt Belalong, *Dransfield SD1249*; Amo, Ulu Belalong LP382, *Kirkup DK907*; Amo, Bkt Belalong, *Edwards 2315*; Bkt Belalong, *Edwards 810*; Sg Baki, FSC, *Edwards 2294*; Amo, Belalong, FSC, *Hovenkamp BR015*; Amo, Belalong, FSC, *Hovenkamp BR017*. **TUT**: Lamunin, *Edwards 740*.

Distribution. Endemic to Borneo (Brunei, Kalimantan, Sabah, Sarawak).

Ecology. Along rivers in mature forest where large boulders are present; lowlands below 500 m a.s.l. Threat: Least Concern.

Diplazium pallidum (Blume) T.Moore, Index Fil. 16: 333. 1861. (Fig. 12).

(=) *Diplazium crenatoserratum* (Blume) T.Moore, Index Fil. 121: 325. 1859.

BEL: Labi, Sg Mendaram, *Johns RJ6805*; Labi, Wasai Wong Kadir, *Johns RJ7435*, *Cicuzza 2583*; Sg Rampayoh, Sandstone, Labi, *Coode MC7255*; Andulau, *Ashton A188*; Sg Liang, *Wong WKM949*. **TEM**: Amo, Bkt Belalong, *Poulsen ADP346*; Amo, Sg Belalong, *Cicuzza 2743*; Bkt Belalong, *Wong WKM1363*; Bkt Patoi, *Simpson 2214*; Sg Belalong, *Edwards 2082*; Batu Apoi, *Poulsen ADP26*; Bkt Belalong, *Sands MS5540*; FSC, *Schatz GS3306*; Amo, K Belalong, *Wong WKM1422*; Amo, Batu Apoi FR (K Belalong FSC), *Ariffin et al. BRUN23426* (two sheets), *Poulsen ADP73*, *Poulsen ADP91*, *Nielsen 1069*; Ulu Temburong, *Ariffin et al. BRUN24119*, *Johns RJ6918*, *Said et al. BRUN15894*; Bkt Belalong, *Dransfield SD1218*; G Retak, *Johns RJ6729*, *Johns RJ6681*; Sg Belalong, FSC, *Hovenkamp BR019*; Amo, Sg Belalong FSC, *Cicuzza 2606*, *Cicuzza 2609*. **TUT**: Telisai, Telamba bridge, *Ariffin et al. BRUN20761*.

Distribution. Indochina, throughout Malesia to the Solomon Islands and Australia.

Ecology. Occurs in forests with well-drained soil, secondary forests, and disturbed forests; lowlands to 1500 m a.s.l. Threat: Least Concern.

Figure 12. Athyriaceae. *Diplazium pallidum* (Photo D. Cicuzza).

Diplazium polypodioides Blume, Enum. Pl. Javae 2: 194. 1828.

(=) *Diplazium asperuma* Blume, Enum. Pl. Javae 2: 195. 1828.

(=) *Athyrium asperum* (Blume) Milde, Bot. Zeit. 1870: 353. 1870.

TEM: Amo, Batu Apoi FR, *Poulsen ADP184*.
Distribution. India, Sri Lanka, China, Indochina, throughout Malesia to the Solomon Islands.

Ecology. Along streams with large boulders and partly-open canopies; lowlands to 1000 m a.s.l. Threat: Least Concern.

Diplazium porphyrorachis (Baker) Diels, Nat. Pflanzenfam. [Engler & Prantl] 1(4). 225. 1899.

BEL: Sg Ingei, Batu Melintang, *Edwards 2349*; Sg Mendaram, *Ariffin et al. BRUN23237*; Labi Hills, Sg Rampayoh, *Ariffin et al. BRUN22451*; Labi, Wasai Wong Kadir, *Cicuzza 2586*. **TEM**: Amo, Bkt Belalong, *Poulsen ADP91*; Amo, Bkt Retak, *Johns RJ6624*; Amo, Sg Temburong, *Johns RJ7256*; Amo, Bkt Retak, *Johns RJ6682*; Amo, Batu Apoi FR (K Belalong FSC), *Poulsen ADP80*; Amo, K Belalong FSC; *Edwards 2166*; Amo, Ulu Belalong; *Idris et al. BRUN16655*; Batu Apoi, Bkt Gelagas (Bkt Suang), *Simpson 2233*; Batu Apoi, Bkt Gelagas (Bkt Suang), *Simpson 2416*; Amo, Belalong, FSC, *Hovenkamp BR016*; Amo, Belalong, *Cicuzza 2612*; Amo, Sg Belalong, *Cicuzza 2636*. **TUT**: Lamunin, Ladan Hills FR, *Johns RJ7105*; Lamunin, Ladan Hills FR, *Edwards 946*; Rambai, Ulu Tutong, *Johns RJ7514*; Lamunin, water tower, *Edwards 751*; Ladan hill, Banutan, *Edwards 946*.

Distribution. Endemic to Borneo (Brunei, Kalimantan, Sabah, Sarawak).

Ecology. Shady habitats in mature fo.est with well-drained soil; lowlands below 500 m a.s.l. Threat: Least Concern.

Notes

Common but not abundant within the Brunei mature MDF forests. Usually solitary, often fertile. Leaves have a certain degree of morphological variability, specifically in their length and width.

Diplazium tomentosum Blume, Enum. Pl. Javae 2: 192. 1828.

BEL: Sg Mendaram, *Ariffin et al. BRUN22797*. **TEM**: Amo, Bkt Retak, *Johns 6620*; Amo, Bkt Retak, *Johns 6617*; Bkt Tudal Area, *Said et al. BRUN15810*. **TUT**: Rambai, Sg Tutong (Belabau), *Coode 6321*; Bkt Patoi, *Edwards 923*; Amo, Sg Belalong, *Cicuzza 2735*.

Distribution. Indochina, Malaysia (Malay Peninsula, Sarawak, Sabah), Brunei, Indonesia (Sumatra, Java, Kalimantan, Maluku), Philippines.

Ecology. In primary forest, in well-drained soil, in shady habitats; lowlands to 1000 m a.s.l. Threat: Least Concern.

Notes

One of the few fern species which has iridescent leaves.

Diplazium wahauense M.Kato, Darnaedi & K.Iwats., J. Fac. Sci. Univ. Tokyo, Sect. 3, Bot. 15(1): 101. 1991.

TUT: Ladan hill, Banutan catchment, *Edwards 947*.

Distribution. Endemic to Borneo (Brunei, Kalimantan).

Ecology. In primary forest. Threat: Rare in Brunei.

Diplazium xiphophyllum (Baker) C.Chr., Index Filic. 241. 1905.

TEM: Amo, Belalong, *Hovenkamp BR012*; Batu Apoi, *Poulsen ADP114*.

Distribution. Thailand, Malaysia (Malay Peninsula, Sarawak, Sabah), Brunei, Indonesia (Sumatra, Kalimantan, Maluku), and the Philippines.

Ecology. In primary forest. Threat: Rare in Brunei.

Family 5. BLECHNACEAE

5.1. Blechnopsis C.Presl, Abh. Königl. Böhm. Ges. Wiss., ser. 5, 6: 115. 1851.

Blechnopsis finlaysoniana (Wall. ex Hook. & Grev.) C.Presl, Abh. Königl. Böhm. Ges. Wiss., ser. 5, 6: 115. 1851. (Fig. 13).

BEL: Liang, Andulau FR (Sg Liang), *Ibrahim et al. BRUN19831*, *Ariffin et al. BRUN23246*; Labi, Bkt Teraja, *Johns RJ6831*; Arboretum Sg Liang, *Edwards 477*; Wasai Wong Kadir, *Cicuzza 2591*. **TEM**: Amo, Sg Belalong (Amo); *Edwards 2097*; Batu Apoi, Bkt Gelagas (Bkt Suang), *Simpson 2336*; Batu Apoi, Sg Temburong, *Poulsen ADP136*, *Wong WKM481*; Amo, Batu Apoi FR, *Cowley JC39*; Batang Duri, *Kian 4*; Batang Duri, *Kian 2*; Amo, Belalong, FSC *Cicuzza 2615*; Amo, Sg Belalong, *Cicuzza 2632*, Amo, Sg Belalong, *Cicuzza 2659*. **TUT**: Lamunin, Ladan Hills FR, *Johns RJ7101*; Lamunin, Benutan dam, *Edwards 2246*; Ladan hill, Benutan dam, *Edwards 950*.

Distribution. From Indochina, throughout Malesia.

Ecology. In tropical mature forest on well-drained soil and close to streams; lowlands to 1500 m a.s.l. Threat: Least Concern.

Figure 13. Blechnaceae. *Blechnum finlaysoniana* (Photo D. Cicuzza).

Notes

This species can be confused with *B. orientalis*, particularly when leaves of this are large due to nutrient-rich soil. However, within Brunei, the two species can be easily separated. *B. finlaysoniana* is restricted to shady habitats and small gaps in mature forests or secondary forests, whereas *B. orientalis*, if present in forests or forest gaps, is always found on dryer sites, and the pinna are often thinner.

Blechnopsis orientalis (L.) C.Presl, Abh. Königl. Böhm. Ges. Wiss., ser. 5, 6: 477. 1851.

BEL: Labi, Bkt Teraja, *Sands MS5686*; Labi, Bkt Teraja, *Johns RJ6889*; Sg Sagat, *Lee 914*. **BRM**: Kilanas, Terjun Menyusop, *Sands MS5674*; Kota Batu, Kpg Kota Batu, *Johns RJ6794*; UBD campus, *Chin s.n.*; Sg Akar, *Kian 1*; Bandar, *Edwards 402*. **TEM**: Bangar, Bkt Bangar, *Johns RJ7040*; Amo, Bkt Retak, *Wong WKM829, Johns RJ 6590*; Amo, Bkt Belalong, *Wong WKM1481*; Amo, Sg Temburong, *Johns RJ6923*; Amo, G Pagon, *Liaw 26*; Batang Duri, *Kian 9*; Batang Duri, *Kian 5*. **TUT**: Tg Maya, Kpg Bkt Udal, *Voeks RV500*; Telisai, *Johns RJ6792*; Rambai, Tasek Merimbun, *Suzuki K13040*; Rambai, Tasek Merimbun, *Bernstein JHB224*.

Distribution. Throughout the tropics of Asia, Australia, and the Pacific Islands.

Ecology. In sunny places and along hill slopes. Threat: Least Concern.

5.2. Parablechnum C.Presl, Abh. Königl. Böhm. Ges. Wiss., ser. 5, 6: 109. 1851.

Parablechnum vestitum (Blume) Gasper & Salino, Phytotaxa 275(3): 217. 2016.

TEM: G Pagon, *Booth P19*; G Pagon, *Edwards & Cantley 723*; Bkt Retak, *Edwards 854*; Amo, G Pagon ridge, *Wong WKM1849*; Amo, G Pagon, *Coode MC7448*; Amo, Bkt Retak, *Johns RJ6768*.

Distribution. Throughout Malesia except New Guinea.

Ecology. In open sites with humid soil. In Brunei, only collected in the Pagon mountain chain on montane sites above 1500 m a.s.l. Threat: Least Concern.

5.3. Stenochlaena J.Sm., J. Bot. (Hooker) 3: 401. 1841.

Stenochlaena palustris (Burm.f.) Bedd., Ferns S. India, Suppl. (I.): 26. 1876. (Fig. 14).

BEL: Bkt Sawat, Bkt Sawat, *Idris et al. BRUN15844*; Labi, Bkt Teraja, *Johns RJ6887*; Labi, Wasai Wong Kadir; *Johns RJ7431*. **TEM**: Bkt Patoi, *Edwards 2252*. **TUT**: Rambai, Tasek Merimbun, *Bernstein JHB290*, *Uchida K13618*; Rambai, Bkt Tangan, *Suzuki K13313*; Ukong, Kpg Ukong, *Johns RJ7083*.

Distribution. Sri Lanka, India, Indochina, throughout Malesia to Australia and Polynesia.

Ecology. It is found in lowland areas, and is common in flooded areas, swamp forest margins, and channels. The species is collected and eaten as a vegetable throughout Southeast Asia. Threat: Least Concern.

5.4. Telmatoblechnum Perrie, D.J.Ohlsen & Brownsey, Taxon 63(4): 755. 2014.

Telmatoblechnum indicum (Burm.f.) Perrie, D.J.Ohlsen & Brownsey, Taxon 63(4): 755. 2014. (Fig. 15).

BRM: Kota Batu, Bandar Seri Begawan, *Edwards 675*.

Distribution. Indochina, throughout Malesia, to Australia and Western Pacific Islands.

Ecology. In degraded flooded areas. Threat: Least Concern.

Notes

Despite the sole herbarium specimen, this species is rather common, particularly at the disturbed site of peat swamp forest margin in Kuala Belait and Tutong district.

Family 6. CIBOTIACEAE

6.1 Cibotium Kaulf., Berlin. Jahrb. Pharm. Verbundenen Wiss. 21: 53. 1820.

Cibotium barometz (L.) J.Sm., London J. Bot. 1: 437. 1842.

TEM: Amo, Bkt Retak, *Wong WKM828*.

Distribution. India, China, Japan, Indochina, Malaysia (Malay Peninsula, Sarawak), Brunei, Indonesia (Sumatra, Java, Kalimantan, Maluku), and New Guinea.
Ecology. Open sites in forests and forest margins; recorded at 1600 m a.s.l. Threat: rare in Brunei.

Notes

Collected only from a single site on mountain habitat, never collected from lowland sites. However, this species is famous for its medicinal uses and thus there is a need to consider the threat of overexploitation.

Figure 14. Blechnaceae. *Stenochlaena palustris* (Photo D. Cicuzza).

Figure 15. Blechnaceae. *Telmatoblechnum indicum* (Photo D. Cicuzza).

Family 7. CYATHEACEAE

7.1. Alsophila R.Br., Prodr. Fl. Nov. Holland.: 158. 1810.

Alsophila borneensis (Copel.) R.M.Tryon, Contr. Gray Herb. 200: 31. 1970.

(≡) *Cyathea borneensis* Copel., Philipp. J. Sci., C 6: 135. 1911.

TEM: Amo, Batu Apoi FR (K Belalong FSC), *Edwards 2012*, *Edwards 2059*, *Edwards 2063*, *Edwards 2067*, *Edwards 2116*, *Edwards 2117*, *Edwards 2144*, *Edwards 2200*, *Hansen CH1536*, *Nielsen 1038* (3 vouchers); Amo, Sg Isu, *Edwards 2119*; Batu Apoi, Sg Temburong-Machang, *Wong WKM1944*; Sg Baki FSC, *Edwards 2292*.

Distribution. Indochina, Malaysia (Malay Peninsula, Sarawak, Sabah), and Brunei.

Ecology. Along rivers in mature forest. Threat: Rare in Brunei.

Alsophila commutata Mett. in Ann. Mus. Bot. Lugduno-Batavi 1: 53. 1863.

(=) *Cyathea recommutata* Copel., Philipp. J. Sci., C 4: 36. 1909.

TEM: Amo, Bkt Tudal, *Idris et al. BRUN15795*; Amo, Bkt Retak, *Wong WKM786*.

Distribution. Indonesia (Sumatra, Kalimantan), Malaysia (Malay Peninsula, Sarawak, Sabah), Brunei.

Ecology. In mature forest, c. 600 m a.s.l. Threat: Rare in Brunei.

Alsophila glabra Hook. Sp. Fil. 1: 51. 1844.

(=) *Cyathea glabra* (Blume) Copel., Philipp. J. Sci., C 4: 35. 1909.

BEL: Seria, Pekan Seria, *Edwards 910*; Lumut, *Ariffin et al. BRUN23191*.

Distribution. Malaysia (Malay Peninsula, Sarawak, Sabah), Brunei, Indonesia (Sumatra, West Java, Lesser Sunda Islands, Kalimantan).

Ecology. In peat swamp forest and lowland forest. Threat: Rare in Brunei.

Alsophila latebrosa Wall. ex Hook., Sp. Fil. 1: 37. 1844.

(≡) *Cyathea latebrosa* (Wall. ex Hook.) Copel., Philipp. J. Sci., C 4: 52. 1909.

TEM: Amo, Bkt Belalong, *Wong WKM1539*; Amo, Bkt Retak, *Johns RJ6589*; Sg Temburong near Bangar, *Edwards 631*; Bkt Belalong, ridge, *Edwards 2319*.

Distribution. China (Hainan), Indochina, Malaysia (Malay Peninsula, Sarawak, Sabah), Brunei, Indonesia (Sumatra, Kalimantan).

Ecology. In tropical forests. Threat: Rare in Brunei.

Alsophila ramispina Hook., Syn. Fil.: 42. 1866. (Fig. 16).

(≡) *Cyathea ramispina* (Hook.) Copel., Philipp. J. Sci., 4: 36. 1909.

TEM: Amo, Bkt Retak, *Edwards 819*, *Johns RJ6522*, *Johns RJ6769*, *Wong WKM443*; Amo, G Pagon, *Booth P8*, *Edwards & Cantley 722*, *Wong WKM1779*.

Distribution. Endemic to Borneo (Brunei, Kalimantan, Sabah, Sarawak).

Ecology. In primary forests; lowlands to 2500 m a.s.l. Threat: Rare in Brunei.

Figure 16. Cyatheaceae. *Alsophila ramispina* (Photo KM. Wong).

7.2. Sphaeropteris Bernh., J. Bot (Schrader) 1800(2): 122. 1801.

Sphaeropteris alternans (Hook.) R.M.Tryon, Contr. Gray Herb. 200: 21. 1970.

(≡) *Cyathea alternans* (Hook.) C.Presl, Abh. Königl. Böhm. Ges. Wiss., ser. 5, 5: 347. 1848.

BRM: Mentiri pools, *Edwards 673*.

Distribution. Malaysia (Malay Peninsula, Sarawak, Sabah), Brunei, Indonesia (Sumatra).

Ecology. Along rivers and lakes. Threat: Rare in Brunei.

Sphaeropteris angustipinna (Holttum) R.M.Tryon, Contr. Gray Herb. 200: 21. 1970.

(≡) *Cyathea angustipinna* Holttum, Kew Bull. 16: 52. 1962.

BEL: Melilas, Sg Ingei, *Wong WKM616, Edwards 2367*; Melilas, Ulu Ingei, *Dransfield SD958*.

Distribution. Endemic to Borneo (Brunei, Sarawak).

Ecology. Along rivers and in humid sites in mature forest. Threat: Rare in Brunei.

Sphaeropteris leucotricha (Christ) R.M.Tryon, Contr. Gray Herb. 200: 22. 1970.

(≡) *Cyathea leucotricha* Christ, Ann. Jard. Bot. Buitenzorg 20(1): 135. 1905.

TEM: Amo, Sg Belalong, *Edwards 2174*, *Wong WKM1332*; Amo, Batu Apoi FR (K Belalong FSC), *Edwards 999*, *Samhan SN91/9*.
Distribution. Endemic to Borneo (Brunei, Sarawak).

Ecology. In proximity to rivers in mature forest, in lowland forest. Threat: Rare in Brunei.

Sphaeropteris moluccana (R.Br. ex Desv.) R.M.Tryon, Contr. Gray Herb. 200: 22. 1970. (Fig. 17).

(≡) *Cyathea moluccana* R.Br. ex Desv., Mém. Soc. Linn. Paris 6(3): 322. 1827.

BEL: Labi, Bkt Teraja, *Simpson 2077*; Seria, Badas SL, *Ashton A141*; Melilas, Bkt Batu Patam (Ulu Ingei), *Wong WKM1019*; Liang, Andulau FR (Sg Liang), *Ariffin et al. BRUN22033*, Labi, Ulu Sg Mendaram, *Ariffin et al. BRUN22809*; Belait, *Kirkup DK497*. **BRM**: Kpg Dadap, recreation forest, *Edwards 2274*. **TEM**: Batu Apoi, Sg Temburong, *Poulsen ADP69*, *Edwards 2154, Schatz GS3295*, *Lee 1016*; Batu Apoi, Sg Temburong-Machang, *Wong WKM1924*, *Athen PA006*; Amo, Batu Apoi FR (K Belalong FSC), *Edwards 2011*, *Samhan SN91/7*, *Samhan SN91/11*; Batang Duri Mini-Zoo, *Kian 3*. **TUT**: Rambai, Ulu Tutong, *Kirkup DK497*; Ukong, Andulau FR, *Ariffin et al. BRUN21950*; Kago dam, *Cicuzza 2648*.

Distribution. Malaysia (Malay Peninsula, Sarawak, Sabah), Brunei, Indonesia (Sumatra, Kalimantan, Sulawesi, Maluku).

Ecology. In primary and secondary forests, along streams with boulders along banks; lowlands to 900 m a.s.l. Threat: Least Concern.

Sphaeropteris polypoda (Baker) R.M.Tryon, Contr. Gray Herb. 200: 23. 1970.

(≡) *Cyathea polypoda* Baker, Trans. Linn. Soc. London, Bot 4(2): 250. 1894.

TEM: Amo, Bkt Retak, *Wong WKM783*; Bkt Retak, summit, *Edwards 838*.

Distribution. Malay Peninsula, Borneo (Brunei, Kalimantan, Sabah, Sarawak), and the Philippines.

Ecology. In mature lowland tropical forests below 500 m a.s.l. Threat: Rare in Brunei.

Figure 17. Cyatheaceae. *Sphaeropteris moluccana* (Photo D. Cicuzza).

Sphaeropteris squamulata (Blume) R.M.Tryon, Contr. Gray Herb. 200: 23. 1970.

(≡) *Cyathea squamulata* (Blume) Copel., Philipp. J. Sci., C 4: 37. 1909.

BEL: Labi, Wasai Mendaram, *Forman LLF1030*; Sg Gelugos, Wasai Wong Kadir, *Edwards 2551*, *Edwards 2573*; Mentiri pools, *Edwards 674*; Benutan lake, *Edwards 2234*, *Edwards 2244*; Wasai Wong Kadir, *Nazihah et al. BRUN24575*.

Distribution. Indonesia (Sumatra, Java, Kalimantan), Malaysia (Malay Peninsula, Sarawak, Sabah), Brunei, Philippines.

Ecology. Lowland forests to 1500 m a.s.l. Threat: Least Concern.

Sphaeropteris trichodesma (Scort.) R.M.Tryon, Contr. Gray Herb. 200: 23. 1970. (Fig. 18).

(≡) *Cyathea trichodesma* (Scort.) Copel., Philipp. J. Sci., C 4: 55. 1909.

BEL: Labi, Sg Teraja, *Edwards 794*, *Edwards 794*, *Edwards 2527*; Wasai Wong Kadir, *Cicuzza 2582*. **BRM**: Kilanas, Terjun Menyusop, *Sands MS5680*; Mentiri, Kpg Mentiri, *Edwards 670*, *Edwards 671*; Sg Akar, *Edwards 512*. **TEM**: Amo, Bkt Retak, *Edwards 844*, *Edwards 853*; Bkt Patoi, *Edwards 877*.

Figure 18. Cyatheaceae. *Sphaeropteris trichodesma* (Photo D. Cicuzza).

Distribution. Malaysia (Malay Peninsula, Sarawak, Sabah), Brunei, Indonesia (Kalimantan).

Ecology. Lowland primary forests, to 1500 m a.s.l. Threat: Least Concern.

Sphaeropteris tripinnata (Copel.) R.M.Tryon, Contr. Gray Herb. 200: 23. 1970.

(≡) *Cyathea tripinnata* Copel., Philipp. J. Sci. 1(Suppl. 4): 251. 1906.

TEM: Amo, G Pagon ridge, *Wong WKM1890*.

Distribution. Malaysia (Malay Peninsula, Sabah), Brunei, Indonesia (Java, Kalimantan, Maluku), Philippines.

Ecology. Primary forests between 250–1700 m a.s.l. Threat: Least Concern.

Family 8. CYSTODIACEAE

8.1. Cystodium J.Sm. in W.J.Hooker, Gen. Fil.: t 96. 1842.

Cystodium sorbifolium (Sm.) J.Sm., Gen. Fil. [Hooker] t. 96. 1841. (Fig. 19).

BEL: Labi, Wasai Wong Kadir, *Forman LLF1054*, *Johns RJ7446*, *Edwards 2553*; Labi, Sg Mendaram, *Johns RJ6806*; Sg Teraja, *Edwards 2511*; Seria, Badas FR, *Wong WKM2*. **TEM**: Amo, Batu Apoi FR (K Belalong FSC), *Edwards 986*, *Poulsen ADP93*; Sg Babi, *Edwards 2148*; Amo, Batu Apoi FR (K Belalong FSC), *Nielsen 1028*, *Edwards 2449*; Amo, Sg Belalong (Amo), *Edwards 2098*; Amo, Batu Apoi, *Lee 993*; Amo, Batu Apoi FR (K Belalong FSC), *Hansen CH1522*, *Hussain et al. BRUN15679*; Amo, K Belalong, *Johns RJ6992*; Amo, Sg Temburong, *Johns RJ7379*, *Lee SL1043*; Batu Apoi, Bkt Gelagas (Bkt Suang), *Simpson 2396*; Amo, Batu Apoi FR (K Belalong FSC), *Edwards 2179*. **TUT**: Rambai, Ulu Tutong, *Edwards 2403*, *Johns RJ7483*; Lamunin, Ladan Hills FR, *Edwards 944*, *Edwards 750*; Lamunin, Benutan dam, *Edwards 2237*; Lamunin, Benutan dam, *Edwards 2332*.

Distribution. Borneo (Brunei, Kalimantan, Sabah, Sarawak), Sulawesi, Maluku, New Guinea.

Ecology. Along rivers in mature forests, albeit not abundant; lowlands, c. 400 m a.s.l. Threat: Least Concern.

Figure 19. Cystodiaceae. *Cystodium sorbifolium* (Photo KM. Wong).

Family 9. DAVALLIACEAE

9.1. Davallia Sm., Mém. Acad. Roy. Sci. (Turin) 5: 414. 1793.

Davallia angustata Wall. ex Hook. & Grev., Icon. Filic. t. 231. 1831.

BEL: Labi, Jln Labi, *Edwards 2044*; Labi, Kpg Teraja, *Wong WKM990*; Liang, Badas (Sg Liang), *Wong WKM181*. **TEM**: Batu Apoi, Bkt Gelagas (Bkt Suang), *Simpson 2224*, *Simpson 2318*; Bkt Patoi, *Edwards 2259*. **TUT**: Rambai, Bkt Bedawan (Ulu Tutong), *Joffre et al. BRUN18279*.

Distribution. Indochina, Malaysia (Malay Peninsula, Sarawak, Sabah), Brunei, Indonesia (Sumatra, Kalimantan, Sulawesi), Philippines, Micronesia.

Ecology. In lowland tropical forests to 1000 m a.s.l. Threat: Least Concern.

Davallia denticulata (Burm.f.) Mett. ex Kuhn, Filic. Afr. 27. 1867.

BRM: Jln Gadong, *Edwards 433*; Muara, Coastal Kerangas, *Edwards 790*; Serasa, Meragang Beach, *Idris et al. BRUN17365*.

TEM: Amo, Sg Belalong, *Edwards 2133*; Amo, Batu Apoi FR (K Belalong FSC), *Edwards 2111*; Bkt Patoi, *Edwards 2263*; Amo, Belalong, *Cicuzza 2614*; Amo, Sg Belalong, *Cicuzza 2736*. **TUT**: Tg Maya, Jln Tutong-Belait (Pasir Puteh), *Paing BRUN15554*, *Ariffin et al. BRUN21720*; Telisai, Pasir Puteh, *Johns RJ6507*.

Distribution. Tropical Africa, East and Southeast Asia, throughout Malesia, to Australia and the Pacific Islands.

Ecology. Epiphyte in secondary forest, parks, plantations, and urban areas; lowlands to 1000 m a.s.l. Threat: Least Concern.

Davallia divaricata Blume, Enum. Pl. Javae 2: 237. 1828.

TEM: Amo, Batu Apoi FR (K Belalong FSC), *Poulsen ADP195*; Amo, K Belalong, *Dransfield SD1003*, *Wong WKM275*, *Johns RJ7421*, *Ashton A20*, *Ashton A323*, *Wong WKM1345*; Batu Apoi, Sg Selapon, *Wong WKM2091*; Amo, Sg Temburong, *Johns RJ7421*; Amo, Sg Temburong, *Wong WKM1345*.

Distribution. India, China, Indochina, throughout Malesia to the Solomon Islands.

Ecology. Epiphyte in secondary forest, plantation, and city parks; lowlands to 1000 m a.s.l. Threat: Least Concern.

Davallia heterophylla Sm., Mém. Acad. Roy. Sci. (Turin) 5: 414–415. 1793.

BRM: Mentiri, Meragang, *Edwards 2327*; Muara, kerangas forest, *Edwards 785*; Kota Batu, P Chermin, *Edwards 621*; Sg Dolhakim, *Edwards 564*.

Distribution. India, Indochina, throughout Malesia, and the Pacific Islands.

Ecology. In lowland forests, to 1000 m a.s.l. Threat: Least Concern.

Davallia parvula Wall. ex Hook. & Grev., Ic. Filic. pl. 138. 1829. (Fig. 20).

BEL: Liang, Badas (Sg Liang), *Ashton A135*; *Ariffin et al. BRUN23283*; Seria, Pekan Seria, *Edwards 918*.

Distribution. Malaysia (Malay Peninsula, Sarawak, Sabah), Brunei, Indonesia (Sumatra, Kalimantan), Papua New Guinea.

Ecology. Lowland tropical forests to 1000 m a.s.l. Threat: Least Concern.

Davallia pectinata Sm., Mém. Acad. Sci. (Turin) 5: 415. 1793.

BEL: Liang, Jln Badas (Lumut), *Edwards 586*. **BRM**: Muara, Kerangas forest, *Edwards 787*; P Chermin, *Edwards 622*. **TUT**: Telisai, Pasir Puteh, *Johns RJ6504*, *Ariffin ARK3*; Telisai, Jln Tutong-Telisai, *Idris et al. BRUN15857*; Tg Maya, Jln Tutong-Belait (Pasir Puteh), *Simpson 2185*.

Figure 20. Davalliaceae. *Davallia parvula* (Photo D. Cicuzza).

Figure 21. Davalliaceae. *Davallia repens* (Photo D. Cicuzza).

Distribution. India, China, Indochina, throughout Malesia to the Pacific Islands.

Ecology. In mature and secondary forest; lowlands to 1000 m a.s.l. Threat: Least Concern.

Davallia repens (L.f.) Kuhn, Fil. Afr. 27. 1868. (Fig. 21).

BEL: Melilas, Sg Ingei, *Edwards 2358*, *Edwards 2376*, *Kessler PK422*; Labi Road, *Edwards 2045*; Melilas, Sg Topi, *Joffre s.n*. **TEM**: Labu, Bkt Patoi (Peradayan FR), *Ashton A130*, *Edwards 869*; Amo, K Belalong FSC, *Middleton LCL777*; Amo, Sg Temburong, *Coode MC6610*, *Johns RJ6930*, *Johns RJ7158*, *Sands MS5543*, *Sands MS5844*; Amo, Bkt Belalong, *De Vogel 9024*; Amo, K Belalong, *De Vogel 8948*; Amo, Sg Belalong, *Edwards 2084*; Batu Apoi, Bkt Gelagas (Bkt Suang), *Simpson 2230*, *Simpson 2298*; Amo, Bkt Tudal, *Idris et al. BRUN15833*, *Idris et al. BRUN16164*; Amo, Bkt Retak, *Edwards 821*, *Johns RJ6675*, *Sands MS5236*, *Wong WKM913*, *Wong s.n*.; Amo, G Pagon, *Wong WKM1782*; *Liaw 17*; G Pagon, *Booth P24*; Amo, K Belalong, *Dransfield SD1006*; Sg Enkiang, *Edwards 2068*. **TUT**: Rambai, Ulu Tutong, *Johns, RJ7542*; Ulu Sg Medit, *Jangarun BRUN22857*.

Distribution. Africa, Madagascar, Sri Lanka, India, China, Japan, Indochina, throughout Malesia, Australia (Queensland), the Pacific Islands.

Ecology. In lowland tropical forests to 1000 m a.s.l. Threat: Least Concern.

Davallia solida (G.Forst) Sw., J. Bot. (Schrader) 1800(2): 87. 1801.

TEM: Amo, Bkt Lutut LP297, *Ariffin et al. BRUN20822*. **TUT**: Rambai, Sg Tutong (Belabau), *Coode MC6372*.

Distribution. Sri Lanka, India, China, Thailand, Indochina, Malaysia (Malay Peninsula, Sarawak, Sabah), Brunei, Indonesia (Sumatra, Java, Lesser Sunda Islands, Kalimantan, Maluku), Philippines, New Guinea, Australia and the Pacific Islands.

Ecology. In tropical forests to 1000 m a.s.l. Threat: Least Concern.

9.2. Davallodes Copel., Philipp. J. Sci., C 3: 33. 1908.

Davallodes hymenophylloides (Blume) M.Kato & Tsutsumi, Acta Phytotax. Geobot. 59: 12. 2008.

TEM: Amo, G Pagon ridge, *Wong WKM1916*; Amo, Bkt Retak, *Johns RJ6631*, *Johns RJ6685*, *Johns RJ6713*.

Distribution. Sri Lanka, India, Thailand, Malaysia (Malay Peninsula, Sabah, Sarawak), Brunei, Philippines, Indonesia (Sumatra, Java, Lesser Sunda Islands, Kalimantan).

Ecology. Epiphytic in secondary forests between 500–2200 m a.s.l. Threat: Least Concern.

Family 10. DENNSTAEDTIACEAE

10.1. Histiopteris (J.Agardh) J.Sm., Hist. Fil.: 294. 1875.

Histiopteris incisa (Thunb.) J.Sm., Hist. Fil. 295. 1875.

TEM: Batu Apoi, Bkt Gelagas (Bkt Suang), *Simpson 2307*, *Liaw 46*.

Distribution. Pantropical.

Ecology. Sunny and disturbed sites; lowlands to 1000 m a.s.l. Threat: Least Concern.

Histiopteris stipulacea (Hook.) Copel. Philipp. J. Sci. C 3: 347. 1909.

TEM: Amo, Bkt Belalong, *Edwards 2309*.

Distribution. Malaysia (Malay Peninsula, Sarawak, Sabah), Brunei, Indonesia (Sumatra, Maluku), Papua New Guinea.

Ecology. Forest edges on montane forests above 1000 m a.s.l. Threat: Least Concern.

10.2. Microlepia C.Presl, Tent. Pterid.: 124. 1836, *nom. cons.*

Microlepia manilensis (Goldm.) C.Chr., Index Filic.: 427. 1906.

BEL: Pipeline near Wasan, *Edwards 974*.

Distribution. Malaysia (Sarawak, Sabah), Brunei, Indonesia (Java, Kalimantan, Sulawesi), Philippines.

Ecology. In open areas with humid soil. Threat: Rare in Brunei.

Microlepia puberula Alderw., Bull. Jard. Bot. Buitenzorg, sér. 2, 11: 17. 1913.

TEM: Bkt Patoi, *Edwards 2260*.

Distribution. Indochina, Malaysia (Malay Peninsula, Sarawak), Brunei, Indonesia (Sumatra, Java, Kalimantan, Maluku).

Ecology. In mature forest. Threat: Rare in Brunei.

Microlepia speluncae (L.) T.Moore, Index Fil. (T. Moore) 93. 1857.

BEL: Layong, pipeline, *Edwards 966*. **TEM**: Amo, K Belalong, *Dransfield SD1030*; Bkt Patoi, *Edwards 2261*. **TUT**: Lamunin, Layong-Gadong Pipeline, *Edwards 966*; Tasek Merimbun, *Edwards 588*; Benutan reservoir, *Edwards 929*.

Figure 22. Dennstaedtiaceae. *Pteridum esculentum* (Photo KM. Wong).

Distribution. Pantropical.

Ecology. Shady areas in forests. Threat: Least Concern.

10.3. Pteridium Geld. ex Scop., Fl. Carniol.: 169. 1760.

Pteridium esculentum (G.Forst.) Cockayne, Rep. Bot. Surv. Tongariro Nat. Park 34. 1908. (Fig. 22).

BRM: Gadong, *Ariffin et al. BRUN22782*. **TEM**: Bangar, Bkt Bangar, *Johns RJ7039*. **TUT**: Telisai, Kpg Telisai, *Johns RJ6776*; Rambai, Tasek Merimbun, *Suzuki K13033*; Bkt Lebadak, St line, *Sinclair KEP80177*; Ukong, Kpg Ukong, *Niga NN177*.

Distribution. India, Indochina, Malaysia (Malay Peninsula, Sarawak, Sabah), Brunei, Indonesia (Sumatra, Kalimantan, Maluku), Philippines, Australia, New Zealand, the Pacific Islands.

Ecology. Open sites in full sun. Threat: Least Concern.

Family 11. DIDYMOCHLAENACEAE

11.1. Didymochlaena Desv., Ges. Naturf. Freunde Berlin Mag. Nauesten Entdeck. Gesammten Naturk. 5: 303. 1811.

Didymochlaena truncatula (Sw.) J.Sm., J. Bot. (Hooker) 4: 196. 1842[1841].

TEM: Amo, Bkt Retak, *Johns RJ6734*; Amo, G Pagon ridge, *Wong WKM1904*.

Distribution. Pantropical in the wide sense.

Ecology. In dense forest with rich soil. In Brunei also in lowland hilltops, otherwise at medium altitude, submontane forest. Threat: Least Concern.

Family 12. DIPTERIDACEAE

12.1. Cheiropleuria C.Presl, Abh. Königl. Böhm. Ges. Wiss., ser. 5, 6: 189. 1851.

Cheiropleuria bicuspis (Blume) C.Presl, Abh. Königl. Böhm. Ges. Wiss., ser. 5, 6: 189. 1851. (Fig. 23).

TEM: Amo, G Pagon, *Coode MC7584, Ariffin ARK135*; Amo, G Pagon ridge, *Ariffin ARK128*; *Wong WKM1797*; Amo, Bkt Retak, *Booth P7*, *Booth P29*, *Edwards 839*, *Johns RJ6586*, *Johns RJ6627*, *Wong WKM425*.

Figure 23. Dipteridaceae. *Cheiropleuria* cf. *C. bicuspis* (Photo KM. Wong).

Distribution. China, Japan, Indochina, throughout Malesia.

Ecology. In mature tropical forests, on steep slopes with boulders; lowlands to 1500 m a.s.l. Threat: Rare in Brunei.

Notes

Booth P7 and *Wong WKM425*, with hardly lobed leaves, could be *C. parva* M.Kato, Y.Yatabe, Sahashi & N.Murak.

12.2. Dipteris Reinw., Syll. Pl. Nov. 2: 3. 1825.

Dipteris conjugata Reinw., Syll. Pl. Nov. 2: 3. 1828[1825]. (Fig. 24).

BEL: Labi, Ulu Sg Mendaram trail, *Ariffin et al. BRUN22793*; *Johns RJ6879*; Melilas, Bkt Batu Patam (Ulu Ingei), *Dransfield SD962*. **BRM**: Kumbang Pasang, Jln Kumbang Pasang; *Johns RJ7065*; Kpg Belimbing, *Ariffin et al. BRUN22462*; Sg Awar, *Edwards 438*. **TEM**: Amo, Bkt Retak, *Wong WKM899*; *Liaw 24*; Batu Apoi, Bkt Gelagas (Bkt Suang), *Simpson 2236*; Ridge close to FSA, *Athen PA009*; Bkt Tudal, *Said et al. BRUN15830*.

Distribution. China, Japan, Indochina, throughout Malesia, to Australia and Fiji.

Figure 24. Dipteridaceae. *Dipteris conjugata* (Photo KM. Wong).

Ecology. In forest clearings; near sea level to 1500 m a.s.l. Threat: Least Concern.

Dipteris lobbiana (Hook.) T.Moore, Index Fil. 80. 1857. (Fig. 25).

(=) *Dipteris quinquefurcata* Christ, Farnkr. Erde 123. 1897.

BEL: Melilas, Sg Ingei, *Ashton BRUN5627*; Melilas, Ulu Ingei, *Sands MS5947*; Melilas, Sg Ingei, *Edwards 2368*; Labi, Labi Hills FR, *Ashton A147*; Labi, Kpg Teraja, *Sands MS5683*, *Edwards 2535*, *Edwards 2565*; Labi, Bkt Teraja, *Johns RJ6834*, *Ariffin et al. BRUN23240*; Labi, Bkt Teraja, *Simpson 2078*; *Leong 26*; Labi, Sg Rampayoh, *Sands MS6001*; Labi Wasai Wong Kadir, *Cicuzza 2588*; Labi Wasai Wong Kadir, *Cicuzza 2669*. **BRM**: Mentiri, Mentiri pools; *Sands MS5666*. **TEM**: Amo, Sg Temburong; *Wong WKM463*, *Liaw 48*, *Hovenkamp BR003*, *Edwards 2213*; Batu Apoi, Sg Temburong (Batu Apoi), *Nielsen 976*; Batu Apoi, Sg Temburong (Batu Apoi), *Edwards 2189*; Batu Apoi, Sg Temburong (Batu Apoi), *Poulsen ADP63*; Amo, G Pagon ridge, *Booth s.n.*, *Wong WKM1902*. **TUT**: Lamunin, Benutan dam, *Edwards 2336*; Lamunin, Benutan dam, *Ariffin et al. BRUN24292*; Nyamokning dam, *Bazilah B26*.

Distribution. Malaysia (Malay Peninsula, Sarawak), Brunei, Indonesia (Sumatra, Kalimantan Sulawesi, Maluku), Philippines, Papua New Guinea.

Figure 25. Dipteridaceae. *Dipteris lobbiana* (Photo D. Cicuzza).

Ecology. Occurs in very specific and restricted habitats, where it anchors on rocks in stream beds; lowlands to 1500 m a.s.l. Threat: Least Concern.

Dipteris nieuwenhuisii Christ, Ann. Jard. Bot. Buitenzorg 20(1): 124, t. 3, f. 3. 1905. (Fig. 26).

BEL: Labi, Bkt Teraja, *Johns RJ6845*. **TEM**: Amo, Bkt Retak, *Johns RJ6660*; Amo, Bkt Retak, *Wong WKM456*; Amo, Bkt Retak, *Wong WKM901*.

Distribution. Endemic to Borneo (Brunei, Kalimantan, Sarawak).

Ecology. In mature montane forest. Threat: Rare in Brunei, found only in montane areas of the country.

Dipteris novoguineensis Posth., Recueil Trav. Bot. Néerl. 25: a. 248 f. 1. 1928.

TEM: Amo, Bkt Retak, *Edwards 849*.

Figure 26. Dipteridaceae. *Dipteris nieuwenhuisii* (Photo KM. Wong).

Distribution. Malaysia (Sabah, Sarawak), Brunei, Sulawesi, Papua New Guinea.

Ecology. In mature mixed dipterocarp forest. Threat: Rare in Brunei.

Family 13. DRYOPTERIDACEAE

13.1. Arachniodes Blume, Enum. Pl. Javae 2: 241. 1828.

Arachniodes aristata (G.Forst.) Tindale, Contr. New South Wales Natl. Herb 3(1): 89. 1961.

TEM: Amo, Bkt Retak; *Johns RJ6690*.

Distribution. India, Nepal, China, Japan, Korea, Malaysia (Malay Peninsula, Sabah), Brunei, Indonesia (Java, Lesser Sunda Islands, Maluku), Philippines, Australia, the Pacific Islands.

Ecology. Forests and wet ravines between 100–1600 m a.s.l. Threat: Least Concern.

Arachniodes tripinnata (Goldm.) Sledge, Bull. Brit. Mus. (Nat. Hist.), Bot. 5: 41. 1973.

TEM: Amo, Batu Apoi FR (K Belalong FSC), *Poulsen ADP353*.

Distribution. India, Malay Peninsula, Java, Borneo (Brunei, Kalimantan, Sabah, Sarawak), Philippines.

Ecology. Common in forests. Threat: Least Concern.

13.2. Bolbitis Schott, Gen. Fil. (Vindob.): t. 14. 1835.

Bolbitis heteroclita (C.Presl) Ching. Index Filic., Suppl. 3, 3: 48. 1934.

BEL: Labi, Kpg Teraja, *Sands MS5694*, *Edwards 769*; Batu Apoi, Kpg Selapon, *Dransfield SD1166*. **TEM**: Batu Apoi, Bkt Gelagas (Bkt Suang), *Simpson 2405*; Sg Sitam, FSC, *Edwards 2015*; Amo, Belalong, FSC, *Cicuzza 2506*; Amo, Sg Belalong, *Cicuzza 2738*.

Distribution. India, Bangladesh, Nepal, China, Japan, Indochina, throughout Malesia to the Pacific Islands.

Ecology. Along streams, on mud and humid forest. Threat: Least Concern.

Bolbitis repanda (Blume) Schott, Gen. Fil. (Vindob.): t. 14. 1835.

BRM: Pengkalan Batu, Kpg Wasan, *Edwards 973*. **TEM**: Amo, Batu Apoi FR (K Belalong FSC), *Edwards 2029*; Labu, Bkt Patoi (Peradayan FR), *Edwards 900*; Bangar, Bkt Biang, *Forman LLF921*; Sg Baki, FSC, *Edwards 2105*, *Edwards 2297*. **TUT**: Benutan lake, *Edwards 2235*.

Distribution. Malaysia (Sabah, Sarawak), Brunei, Indonesia (Lesser Sunda Islands, Sulawesi), Philippines, the Pacific Islands.

Ecology. In mature forests. Under good ecological conditions, the species can form large, dense communities. Threat: Least Concern.

Bolbitis sinuata (C.Presl) Hennipman, Blumea 18(1): 148–149. 1970.

BEL: Sg Teraja, *Edwards 2520*; Lamunin, *Edwards 741*. **TEM**: Labu, Peradayan FR, *Johns RJ7056*; Amo, Batu Apoi FR (K Belalong FSC), *Edwards 2150*; Sg Esu, *Edwards 2303*; Sg Babi, *Edwards 2150*; Amo, Belalong, *Cicuzza 2617*; Amo, Sg Belalong, *Cicuzza 2640*, *Cicuzza 2740*, *Cicuzza 2742*.

Distribution. India, Thailand, Malaysia (Malay Peninsula, Sarawak, Sabah), Brunei, Indonesia (Sumatra, Java, Kalimantan, Maluku), Philippines, New Guinea.

Ecology. A terrestrial climber along rivers and riparian areas in mature forests; lowlands to 1000 m a.s.l. Threat: Least Concern.

13.3. Dryopteris Adans., Fam. Pl. 2: 20, 551. 1763, *nom. cons.*

Dryopteris sparsa (D.Don) Kuntze, Revis. Gen. Pl. 2: 813. 1891.

TEM: Amo, Bkt Retak, *Johns RJ6683*.

Distribution. Sri Lanka, India, Myanmar, Nepal, Bhutan, China, Japan, Indochina, throughout Malesia to Australia.

Ecology. common in disturbed sites; lowlands to 1000 m a.s.l. Threat: Least Concern.

13.4. Elaphoglossum Schott ex J.Sm., J. Bot. (Hooker) 4: 148. 1841.

Elaphoglossum annamense C.Chr. & Tardieu, Notul. Syst. (Paris) 8: 209. 1939

TEM: Amo, Bkt Retak, *Johns RJ6523*; Amo, G Pagon, *Wong WKM1840*.

Distribution. Vietnam, Malaysia (Sabah, Sarawak), Brunei, Indonesia (Kalimantan, Maluku, Indonesian New Guinea).

Ecology. In mature submontane and montane forests. Threat: Rare in Brunei.

Elaphoglossum melanostictum (Blume) T.Moore, Ind. Fil. 361. 1862.

TEM: Amo, Bkt Retak, *Edwards 858*, *Wong WKM771*.

Distribution. Thailand, Malaysia, (Malay Peninsula, Sarawak), Brunei, Indonesia (Sumatra, Java, Kalimantan), Philippines.

Ecology. Epiphyte or lithophyte in submontane forests. Threat: Rare in Brunei.

Elaphoglossum norrisii (Hook.f.) Bedd., Ferns Brit. India 23. 1870.

BEL: Bkt Sawat, Jln Labi (km 13), *Haslani HA75*. **TEM**: Batu Apoi, Bkt Gelagas (Bkt Suang), *Simpson 2311*; Batu Apoi, *Samhan SN91/3*.

Distribution. Malaysia (Malay Peninsula, Sarawak), Brunei, Indonesia (Sumatra, Java, Kalimantan, Maluku, Indonesian New Guinea). Ecology: In mature forests to 1500 m a.s.l. Threat: Least Concern.

13.5. Pleocnemia C.Presl, Tent. Pterid.: 183. 1836.

Pleocnemia irregularis (C.Presl) Holttum, Kew Bull. 29: 347. 1974.

BEL: Bkt Sawat, Kpg Merangking, *Ariffin et al. BRUN21987*. **TEM**: Amo, Bkt Belalong, *Sands MS5546*; Amo, Batu Apoi FR (K Belalong FSC), *Poulsen ADP162*; Amo, Batu Apoi FR (K Belalong FSC), *Edwards 2023*; Amo, Batu Apoi FR (K Belalong FSC), *Edwards 2052*; Amo, Batu Apoi FR (K Belalong FSC), *Edwards 2005*; Amo, Batu Apoi FR (K Belalong FSC), *Poulsen ADP294*; Amo, K Belalong, *Wong WKM273*; Sg Babi, *Edwards 2143*. **TUT**: Lamunin, Benutan dam, *Edwards 2247*; Lamunin, Ladan Hills FR, *Ariffin et al. BRUN17607*.

Distribution. Indochina, throughout Malesia, to Fiji.

Ecology. Dry slopes in the lowlands. Threat: Least Concern.

Pleocnemia olivacea (Copel.) Holttum, Reinwardtia 1: 181, f.8, 10. 1951.

BEL: Melilas, Ulu Ingei, *Sands MS5917*; Labi, Sg Mendaram, *Johns. RJ6808*; Sg Teraja, *Edwards 683*, *Edwards 2516*; Wasai Wong Kadir, *Edwards 2572*; Sg Teraja, *Edwards D683*; Labi, Wasai Wong Kadir, *Cicuzza 2673*. **TEM**: Amo, Batu Apoi FR (K Belalong FSC), *Edwards 2177*; Amo, Batu Apoi FR (K Belalong FSC), *Edwards 2051*; Amo, Batu Apoi FR (K Belalong FSC), *Edwards 2050*; Amo, K Belalong, *Ashton A360*; Batu Apoi, *Samhan SN8*; Batu Apoi, *Edwards 2444*. **TUT**: Lamunin, Benutan dam, *Edwards 2236*; Ladan Hills, *Edwards 951*.

Distribution. Malaysia (Malay Peninsula, Sarawak, Sabah), Brunei, Indonesia (Sumatra, Java, Kalimantan).

Ecology. Terrestrial; lowlands to 1600 m a.s.l. Threat: Least Concern.

13.6. Teratophyllum Mett. ex Kuhn, Ann. Mus. Bot. Lugduno-Batavi 4: 296. 1870.

Teratophyllum aculeatum (Blume) Mett. ex Kuhn, Ann. Mus. Bot. Lugduno-Batavi 4: 296. 1869.

BEL: Labi, Sg Teraja, *Edwards 804*. **TEM**: Belalong, FSC, *Edwards 2205*. **TUT**: Lamunin, Ladan Hills FR, *Wong WKM6399*.

Distribution. Malaysia (Malay Peninsula, Sarawak, Sabah), Brunei, Indonesia (Sumatra, Sulawesi, Maluku), Philippines, New Guinea.

Ecology. Humid areas in lowland forests. Threat: Least Concern.

Teratophyllum ludens (Fée) Holttum, Gard. Bull. Straits Settlem. 5: 298, t. 10. 1932.

BEL: Seria, Pekan Seria, *Edwards 914*; Wasai Wong Kadir, *Edwards 2558*; Sg Teraja, *Edwards 2531*. **BRM**: Broken Coal Mine, *Edwards 2304*. **TUT**: Merimbun, *Cicuzza 2555*.

Distribution. Indochina, Malaysia (Malay Peninsula, Sarawak), Brunei.

Ecology. In lowland peat swamp forest. Threat: Rare in Brunei.

Teratophyllum rotundifoliatum (Bonap.) Holttum, Gard. Bull. Straits Settlem. 5: 294, t. 7–8. 1932.

TEM: Amo, Batu Apoi FR (K Belalong FSC), *Poulsen ADP131*; Amo, Ulu Belalong LP382, *Coode MC7868*. **TUT**: Lamunin, Ladan Hills FR, *Idris et al. BRUN17659*.

Distribution. Malaysia (Malay Peninsula, Sarawak, Sabah), Brunei, Indonesia (Sumatra).

Ecology: Lowlands in peat swamp forest. Threat: Least Concern.

Family 14. GLEICHENIACEAE

14.1. Dicranopteris Bernh., Neues J. Bot.(2): 38. 1806.

Dicranopteris curranii Copel., Philipp. J. Sci. 81: 4. 1952.

BRM: Berakas, Berakas FR, *Edwards 783*; Jln Subok, *Edwards 508*; Jln Berangan, *Edwards 448*. **TUT**: Rambai, Tasek Merimbun, *Suzuki K13035*.

Distribution. India, Malaysia (Malay Peninsula, Sabah), Brunei, Indonesia (Sumatra, Java, Lesser Sunda Islands, Kalimantan, Sulawesi), Philippines.

Ecology. Forest margins. Threat: Least Concern.

Dicranopteris linearis (Burm.f.) Underw., Bull. Torrey Bot. Club 34(5): 250. 1907. (Fig. 27).

BEL: Bkt Sawat, Jln Labi (Bkt Sawat), *Forman LLF857*; Labi, Kpg Labi, *Johns RJ6828;* Wasai Wan Kadir, *Edwards 2563*. **BRM**: Kota Batu, Kpg Kota Batu, *Edwards 643*, *Johns RJ6795*; Kota Batu, Kpg Kota Batu, *Johns RJ6796*; Kota Batu, Kpg Kota Batu, *Edwards 643*; Gadong, Jln Gadong, *Edwards 651*; Gadong, Jln Gadong, *Edwards 654*; Jln Subok, *Edwards 507*; Kpg Dadap, *Edwards 2277*; Kiange, *Edwards 403*. **TEM**: Amo, Bkt Retak, *Wong WKM s.n.*, *Edwards*

Figure 27. Gleicheniaceae. *Dicranopteris linearis* var. *linearis* (Photo KM. Wong).

855; Amo, Batu Apoi FR (KBFSC), *Poulsen ADP82*; Bukok, Kpg Sibatang, *Forman LLF951*; Amo, Bkt Retak, *Wong WKM s.n.*; Amo, Bkt Retak, *Edwards 843*; Bangar, Bkt Bangar, *Johns RJ7038*; Labu, Bkt Patoi (Peradayan FR), *Edwards 867*. **TUT**: Rambai, Ulu Tutong, *Johns RJ7623*; Rambai, Tasek Merimbun, *Bernstein JHB356*; Lamunin, Kpg Lamunin, *Edwards 966A*; Telisai, Kpg Telisai, *Johns RJ6793*; Sg Padang, *Edwards 663*; Tasek Merimbun, *Edwards 592*; Jln Tutong, *Edwards 531*.

Distribution. Old World Tropics.

Ecology. Very common species, in open places. Threat: Least Concern.

14.2. Diplopterygium (Diels) Nakai, Bull. Natl. Sci. Mus. Tokyo 29: 47. 1950.

Diplopterygium brevipinnulum (Holttum) Parris, Pl. Mt. Kinabalu 1: 59. 1992.

TEM: Amo, Bkt Retak, *Edwards 848*, *Wong WKM s.n.*; Amo, G Pagon LP 307, *Wong WKM1820*.

Distribution. Endemic to Borneo (Brunei, Kalimantan, Sabah, Sarawak).

Ecology. From lowland hilly sites to montane sites, at forest margins or forest gaps. Threat: Rare in Brunei.

Diplopterygium bullatum (T.Moore) Parris, Pl. Mt. Kinabalu 1: 59. 1992.

TEM: Amo, G Pagon, *Ariffin ARK139*, *Booth P13*, *Wong WKM1768*; Amo, Bkt Retak, *Edwards 837*.

Distribution. Indonesia (Java, Kalimantan), Malaysia (Sarawak, Sabah), Brunei, Papua New Guinea.

Ecology. Tropical forests from mid elevation to montane forest. Threat: Rare in Brunei.

14.3. Gleichenia Sm., Mém. Acad. Roy. Sci. (Turin) 5: 419. 1793.

Gleichenia peltophora Copel., Philipp. J. Sci. 40: 291, t. 1. 1929.

TEM: Amo, G Pagon Periok, *Ashton A458*.

Distribution. Philippines, Malaysia (Sarawak, Sabah), Brunei, Indonesia (Kalimantan, Sulawesi, Maluku, Indonesian New Guinea).

Ecology. Montane sites, at forest margins and forest gaps. Threat: Rare in Brunei.

14.4. Sticherus C.Presl, Tent. Pterid.: 51. 1836, *nom. cons.*

Sticherus hirtus (Blume) Ching, Sunyatsenia 5: 283. 1940.

TEM: Amo, Bkt Tudal, *Idris et al. BRUN16165*; Amo, Bkt Retak, *Edwards 856*, *Wong WKM898*; Amo, G Pagon Periok, *Ashton A232*, *Booth P30*, *Booth P31*, *Booth P32*, *Wong WKM1920*.

Distribution. Malay Peninsula, Brunei, Indonesia (Sumatra, Lesser Sunda Islands, Kalimantan, Sulawesi, Maluku), Philippines, New Guinea, Solomon Islands.

Ecology. In mid-montane forest, usually forming thick thickets at forest edges. Threat: Least Concern.

Notes

The voucher was identified as *Gleichenia hirta* Blume var. *paleacea* (Baker) C.Chr. which is here considered as *Sticherus hirtus* (Blume) Ching.

Sticherus loheri (Christ) Copel., Gen. Fil. [Copeland] 27. 1947.

TEM: Amo, Bkt Retak, *Johns RJ6524*.

Distribution. Malaysia (Sarawak, Sabah), Brunei, Indonesia (Sulawesi, Maluku), Philippines.

Ecology. In montane forests at forest margins and forest gaps. Threat: Rare in Brunei.

Notes

The voucher was identified as *Gleichenia loheri* var. *major* Holttum, which is here considered as *Sticherus loheri* (Christ) Copel.

Sticherus truncatus (Willd.) Nakai, Bull. Natl. Sci. Mus. Tokyo 29: 20, 1950.

BRM: Tasek Gorge, *Edwards 425*. **TEM**: Amo, Batu Apoi FR (K Belalong FSC), *Poulsen ADP96*; Amo, Batu Apoi FR (K Belalong FSC), *Poulsen ADP104*; Amo, Sg Temburong, *Johns RJ7157*; Amo, Batu Apoi FR (K Belalong FSC), *Edwards 2192*; Amo, Batu Apoi FR (K Belalong FSC), *Edwards 2062*. **TUT**: Rambai, Ulu Tutong, *Johns RJ7622A*.

Distribution. Thailand, throughout Malesia.

Ecology. Forest margins and secondary forests. Threat: Least Concern.

Family 15. HYMENOPHYLLACEAE

15.1. Abrodictyum C.Presl, Hymenophyllaceae: 20. 1843.

Abrodictyum idoneum (C.V.Morton) Ebihara & K.Iwats., Blumea 51(2): 243. 2006.

TEM: Amo, Bkt Retak, *Johns RJ6527*; Amo, Bkt Retak, *Johns RJ6565;* Amo, Bkt Retak, *Johns RJ6664*; Amo, Bkt Retak, *Johns RJ6668*; Amo, Bkt Retak, *Johns RJ6531*; Amo, Bkt Retak, *Johns RJ6512*; Amo, G Pagon, *Coode MC7510*; Batu Apoi, Bkt Gelagas (Bkt Suang), *Simpson 2309*; Batu Apoi, Amo, Bkt Retak, *Wong WKM912*; Amo, Bkt Retak, *Wong WKM s.n.*; Bkt Pagon, *Edwards & Cantley 733*; Bkt Retak, *Edwards 828*, *Edwards 859*; Amo, Belalong, FSC, *Cicuzza 2576.*

Distribution. Indochina, Malaysia (Malay Peninsula, Sarawak), Brunei, Indonesia (Maluku), Philippines, New Guinea.

Ecology. In hilly forest with good fertile soil. Threat: Least Concern.

Abrodictyum obscurum (Blume) Ebihara & K.Iwats., Blumea 51(2): 244, 2006.

(=) *Abrodictyum saxatile* (T.Moore) Parris, Fern Gaz. 20(7): 305. 2018.

BEL: Bkt Sawat, Jln Merangking, *Edwards 2400*; Melilas, Sg Ingei, *Edwards 2361*; Pipeline Road, *Edwards 983*; Sg Liang, Arboretum, *Edwards 487*; Bkt Teraja, *Cicuzza 2681*; Labi, Bkt Teraja, *Johns RJ6855*; Labi, Bkt Teraja, *Johns RJ6858*; Labi, Bkt Teraja, *Ariffin et al. BRUN23242*; Labi, Bkt Teraja, *Johns RJ6853*; Labi, Kpg Teraja, *Sands MS5691*; Labi, Bkt Teraja, *Johns RJ6860*; Labi, Sg Mendaram, *Johns RJ6815*; Melilas, Bkt Batu Patam (Ulu Ingei), *Wong WKM1128*; Labi Sg Teraja, *Edwards 2530*. **BRM**: Lumapas, Kpg Dadap, *Edwards 2415*; Jln Sg Akar, *Edwards 521*; Berakas, Kpg Tanah Jambu, *Edwards 2422*; Mentiri, Mentiri pools, *Johns RJ7077*; Mentiri, Mentiri pools, *Johns RJ7074*; Kpg Dadap, *Edwards 2287*; Jln Kota Batu, *Edwards 650*; Jln Sg Akar, *Edwards 441*, *Edwards 523*. **TEM**: Amo, K Belalong, *Ashton A55*, *Dancák 90A*; Amo, Batu Apoi FR (K Belalong FSC), *Poulsen ADP340*, *Lee 1048*; Amo, Bkt Retak, *Wong WKM882*; Amo, Sg Belalong (Amo), *Edwards 942*; Batu Apoi, Sg Temburong (Batu Apoi), *Edwards 2164*; Sg Belalong, *Edwards 2125*; Amo, Sg Temburong, *Coode MC6507*; Amo, K Belalong, *Johns RJ7015*; Batu Apoi, Sg Temburong (Headwaters), *Johns RJ7221*. **TUT**: Rambai, Ulu Tutong, *Johns RJ7643*; Rambai, Ulu Tutong, *Johns RJ7486*; Rambai, Ulu Tutong, *Johns RJ7489*; Rambai, Ulu Tutong, *Johns RJ7517.*

Distribution. Sri Lanka, India, Nepal, Bhutan, China, Taiwan, Japan, Indochina, Malaysia (Malay Peninsula, Sarawak, Sabah), Brunei, Indonesia (Sumatra, Java, Lesser Sunda Islands, Kalimantan, Sulawesi, Maluku, Indonesian New Guinea), Philippines, Papua New Guinea, Solomon Islands, and Australia.

Ecology. Along streams or muddy stream banks in mature forest and secondary vegetation. Threat: Least Concern.

Abrodictyum pluma (Hook.) Ebihara & K.Iwats., Blumea 51(2): 243. 2006.

TEM: Amo, Bkt Retak, *Johns RJ6538*; Amo, Bkt Retak, *Johns RJ6546*; Amo, Bkt Retak, *Johns RJ6569*; Amo, Bkt Retak, *Johns RJ6563*; Amo, Bkt Tudal, *Idris et al. BRUN182*; Batu Apoi, Bkt Gelagas (Bkt Suang), *Simpson 2313*; Amo, Bkt Retak, *Wong WKM s.n.*; Bkt Gelagas (Bkt Suang), *Simpson 2302a.*

Distribution. Indochina, Malaysia (Malay Peninsula, Sarawak, Sabah), Brunei, Indonesia (Sumatra, Java, Kalimantan, Maluku, Indonesian New Guinea), Philippines, Papua New Guinea, and the Solomon Islands.

Ecology. In dense forest and hilly sites, with good and fertile soil. Threat: Least Concern.

Abrodictyum cf. ***pluma*** (Hook.) Ebihara & K.Iwats.

BEL: Sg Ingei, *Dransfield SD943*. **TEM**: Bkt Retak, *Edwards 831*; G Pagon, *Booth P37*; Labi hill, *Cicuzza 2686*.

Abrodictyum setaceum (Bosch) Ebihara & K.Iwats., Blumea 51(2): 244. 2006.

BEL: Labi, Bkt Teraja, *Ariffin et al. BRUN22804*; Labi, Bkt Teraja, *Johns RJ6869*; Labi, Bkt Teraja, *Johns RJ6866*; Melilas, Sg Ingei, *Wong WKM640*; Melilas, Bkt Batu Patam (Ulu Ingei), *Wong WKM1015*; Sukang, Sg Paleh Bangawong, *Kirkup DK685*. **TEM**: Amo, Bkt Belalong, *Dransfield SD1211*. **TUT**: Rambai, Bkt Bahak, *Coode MC6994*; Rambai, Sg Medit, *Simpson 2525*.

Distribution. Malaysia (Malay Peninsula, Sarawak), Brunei, Indonesia (Kalimantan), and Philippines.

Ecology. On hills and submontane tropical forest. Threat: Least Concern.

15.2. Cephalomanes C.Presl, Hymenophyllaceae: 17. 1843.

Cephalomanes javanicum (Blume) C.Presl, Abh. Königl. Böhm. Ges. Wiss., ser. 5, 5: 334. 1848.

BEL: Melilas, Sg Ingei, *Edwards 2359*; Labi, Kpg Teraja, *Sands MS5690*; Labi, Kpg Teraja, *Sands MS5687*; Melilas, Batu Melintang, *Edwards 2345*; Melilas, Sg Ingei, *Wong WKM655*; Labi, Sg Mendaram, *Johns RJ6811*; Labi, Sg Mendaram, *Johns RJ6814*; Labi, Wasai Mendaram, *Johns RJ6822*; Labi, Bkt Teraja, *Johns RJ6851*; K Belait, K Belait, *Johns RJ7121*; Labi, Wasai Wong Kadir, *Johns RJ7437*; Batu Apoi, Bkt Gelagas (Bkt Suang), *Simpson 2380*. **BRM**: Kota Batu, Kpg Kota Batu, *Edwards 649*; Kilanas, Terjun Menyusop, *Sands MS5677*; Mentiri, Mentiri pools, *Johns RJ7078*; Sg Teraja, *Edwards 2521*; Sg Teraja, *Edwards 2514*. **TEM**: Amo, Sg Belalong (Amo), *Ashton A12*; Amo, Sg Belalong (Amo), *Edwards 2140*; Amo, Batu Apoi FR (K Belalong FSC), *Edwards 2081*; Amo, Batu Apoi FR (K Belalong FSC), *Edwards 2031*; Amo, Bkt Belalong, *Wong WKM1519*; Batu Apoi, Sg Temburong (Batu Apoi), *Edwards 2163*; Batu Apoi, Bkt Gelagas (Bkt Suang), *Simpson 2380*; Amo, Sg Temburong, *Johns RJ7288*; Batu Apoi, Sg Temburong (Headwaters), *Johns RJ7225*; Labu, Peradayan FR, *Johns RJ7059*; Amo, Batu Apoi Forest Reserve, *Lee 978*, *Lee 905*; Amo, Sg Temburong, *Johns RJ7371*; Sg Baki, Edwards, 2186; Sg Babi, *Edwards 2153*; Bkt Patoi, *Edwards 893*; Sg Belalong, *Dancák 100*; Amo, Sg Temburong, *Johns RJ7371*; Amo, Belalong, *Cicuzza 2658*; Amo, Batu Apoi FR (K Belalong FSC), *Edwards 2032*; Amo, Ulu Temburong (Wong Nguan), *Coode MC6655*; Amo, K Belalong, *Ashton A19*; Amo, Sg Temburong, *Johns RJ7123*, *Johns RJ7125*, Sg Apan, *Edwards 2401*; Batu Apoi, Sg Temburong (Headwaters), *Johns RJ7196*; Amo, K Belalong, *Johns RJ6988*. **TUT**: Lamunin, Ladan Hills FR, *Joffre et al. BRUN18146*, *Edwards 949*; Rambai, Ulu Tutong, *Johns RJ7485*; Rambai, Ulu Tutong, *Johns RJ7642*; Rambai, Ulu Tutong, *John RJ7516*; Rambai, Ulu Tutong, *Johns RJ7497*; Labi, Sg Mendaram, *Johns RJ6811*; Labi, Sg Mendaram, *Johns RJ6814*; Labi, Wasai Mendaram, *Johns RJ6822*; Labi, Bkt Teraja, *Johns RJ6851*.

Distribution. India, Nepal, Bhutan, China, Japan, Indochina, Malaysia (Malay Peninsula, Sarawak, Sabah), Brunei, Philippines, Indonesia (Sumatra, Java, Kalimantan, Maluku), New Guinea, Solomon Islands.

Ecology. Shaded and humid sites in lowland forest, also along streams. Threat: Least Concern.

Cephalomanes singaporianum Bosch, Ned. Kruidk. Arch. 4(4). 351. 1859.

BEL: Labi, Sg Mendaram, *Johns RJ6820*; Labi, Sg Mendaram, *Ariffin et al. BRUN22805*; Labi, Bkt Teraja, *Johns RJ6848*; Labi, Bkt Teraja, *Johns RJ6850*; Labi, Bkt Teraja, *Johns RJ6856*; Labi, Bkt Teraja, *Johns RJ6867*; Labi, Bkt Teraja, *Johns RJ6894*; Melilas, Sg Ingei, *Edwards 2360*; Melilas, Sg Ingei, *Wong WKM617*; Melilas, Sg Ingei, *Wong WKM629*; Melilas, Ulu Belait, *Sands MS5888*; Melilas, Bkt Batu Patam (Ulu Ingei), *Dransfield SD963*; Melilas, Bkt Batu Patam (Ulu Ingei), *Dransfield SD938*; Melilas, Bkt Batu Patam (Ulu Ingei), *Dransfield SD942*; Sukang, Kpg Buau, *Watu et al. BRUN19143*; Sg Liang, *Edwards 486*; Wasai Wan Kadir, *Edwards 2547*; Labi, Andulau, *Cicuzza 2577*. **TEM**: Amo, Sg Temburong, *Coode MC6535*; Amo, Sg Temburong, *Wong WKM465*; Amo, K Belalong, *Johns RJ7017*; Amo, Sg Belalong (Amo), *Edwards 2087*, *Edwards 941*, *Edwards 2125*, *Edwards 2341*; Amo, Batu Apoi FR (K Belalong FSC), *Poulsen ADP204*; Amo, Sg Temburong, *Johns RJ6976*; Amo, K Belalong, *Johns RJ6999*; Amo, Sg Sibut, *Johns RJ6910*; Amo, Sg Temburong, *Johns RJ6937*; Batu Apoi, Selapon (Bkt Beliton), *Wong WKM2049*; Belalong, FSC, *Dancák 76*; Amo, Belalong, FSC, *Cicuzza 2519*, *Cicuzza 2604*, *Cicuzza 2613*; Amo, Sg Belalong *Cicuzza 2628*, Kpg Bakok, *Cicuzza 2709*. **TUT**: Rambai, Ulu Tutong, *Johns RJ7582*; Rambai, Ulu Tutong, *Johns RJ7481*; Rambai, Ulu Tutong, *Johns RJ7499*; Rambai, Ulu Tutong, *Johns RJ7546*; Rambai, Bkt Bahak, *Coode MC6997*; Rambai, Sg Medit, *Simpson 2533*.

Distribution. Malaysia (Malay Peninsula, Sarawak, Sabah), Brunei, Indonesia (Sumatra, Kalimantan).

Ecology. Common in forests and along streams. Threat: Least Concern.

15.3. Crepidomanes C.Presl, Abh. Königl. Böhm. Ges. Wiss, ser. 5, 6: 258. 1851.

Crepidomanes aphlebioides (Christ) I.M.Turner, Asian J. Trop. Biol. 1(2): 26. 1995.

TEM: Amo, Bkt Belalong, *Wong WKM1520*.

Distribution. Malaysia (Malay Peninsula, Sarawak, Sabah), Brunei, Indonesia (Sumatra, Maluku, Indonesian New Guinea), Papua New Guinea, Solomon Islands, Vanuatu, Fiji, Australia.

Ecology. Epiphytic in mature hilly forests to 600 m a.s.l. Threat: Rare in Brunei.

Crepidomanes bipunctatum (Poir.) Copel., Philipp. J. Sci. 67(1): 59. 1938.

(=) *Crepidomanes bilabiatum* (Nees & Blume) Copel., Philipp. J. Sci. 67: 59. 1938.

TEM: Amo, Bkt Retak, *Johns RJ6755*; Amo, Bkt Retak, *Johns RJ6753*; Amo, Bkt Retak, *Johns RJ6746*; Amo, Sg Belalong (Amo), *Edwards 2142*; Labu, Bkt Patoi (Peradayan FR), *Edwards 890* [these vouchers were identified as *Trichomanes bipunctatum*]; Amo, Bkt Retak, *Wong WKM876*.

Distribution. Widely distributed across the Old-World Tropics.

Ecology. Shady forest areas with well-drained and humid soil. Threat: Least Concern.

Crepidomanes christii (Copel.) Copel., Philipp. J. Sci. 67: 60. 1938.

TEM: Amo, Sg Temburong, *Coode MC6659*; Batu Apoi, Bkt Gelagas (Bkt Suang), *Simpson 2438*; Amo, Batu Apoi FR (K Belalong FSC), *Poulsen ADP262*; Amo, K Belalong FSC, *Edwards 2188*; Amo, Sg Belalong (Amo), *Edwards 2141*; Amo, Sg Belalong (Amo), *Edwards 2139*; Amo, Batu Apoi FR (K Belalong FSC), *Edwards 2034*; Batu Apoi, *Edwards 2460*; Sg Esu, FSC, *Edwards 2202*, *Edwards 2203*; Belalong, FSC, *Dancák 75*, *Dancák 83*, *Dancák 101*.

Distribution. Thailand, Malay Peninsula, Sumatra, Borneo (Brunei, Kalimantan, Sabah, Sarawak), and the Philippines.

Ecology. Epiphytic or lithophytic in lowland forests. Threat: Least Concern.

Crepidomanes grande (Copel.) Ebihara & K.Iwats., Blumea 51(2): 239. 2006.

TEM: Labu, Bkt Patoi (Peradayan FR), *Edwards 883*.

Distribution. Malaysia (Sabah, Sarawak), Brunei, Indonesia (Sumatra, Java, Kalimantan, Sulawesi, Maluku), Philippines, New Guinea, Solomon Islands, and Micronesia.

Ecology. Well-drained soil in mature and slightly disturbed forests; lowlands to 1500 m a.s.l. Threat: Least Concern.

Crepidomanes parvulum (Poir.) Nivart, Senterre & Dubuisson, Phytotaxa 523(1): 122. 2021.

(=) *Crepidomanes minutum* (Blume) K.Iwats., J. Fac. Sci. Univ. Tokyo, Sect. 3, Bot. 13(5): 524. 1985.

BEL: Sg Teraja, *Edwards 719*, *Edwards 777*, *Edwards 2542*. **TEM**: Sg Belalong, *Edwards 2091*; Bkt Patoi, *Edwards 2272*.

Distribution. The Paleotropics (Africa to Polynesia), Siberia, Japan, and Australia.

Ecology. Epiphytic or lithophytic in lowland forests. Threat: Least concern.

15.4. Didymoglossum Desv., Mém. Soc. Linn. Paris 6: 330. 1827.

Didymoglossum beccarianum (Ces.) Senterre & Rouhan, Phytotaxa 292(3): 210. 2017.

(=) *Didymoglossum motleyi* (Bosch) Ebihara & K.Iwats., Blumea 51(2): 236. 2006.

TEM: Belalong, FSC, *Dancák 119*; W ridge FSC, *Edwards 2207*.

Distribution. Seychelles, Sri Lanka, India (Andaman Islands), Taiwan, Japan (Ryukyu Islands), Indochina, Malaysia (Malay Peninsula, Sarawak, Sabah), Brunei, Indonesia (Java, Kalimantan, Maluku, Indonesia New Guinea), Philippines, Papua New Guinea, to the Solomon Islands, Micronesia, and Australia.

Ecology. Mature tropical dipterocarp forest. Threat: Rare in Brunei.

Didymoglossum bimarginatum (Bosch) Ebihara & K.Iwats., Blumea 51(2): 236. 2006.

BEL: Seria, Pekan Seria, *Edwards 922*; Sg Teraja, *Edwards 717*, *Edwards 806*. **TEM**: Labu, Bkt Patoi (Peradayan FR), *Edwards 881*; Labu, Bkt Patoi (Peradayan FR), *Edwards 889*; Labu, Bkt Patoi (Peradayan FR), *Edwards 891*. **TUT**: Lamunin, Kpg Lamunin, *Edwards 758*.

Distribution. Sri Lanka, India, China, Japan, Indochina, Malaysia (Malay Peninsula, Sabah), Brunei, Indonesia (Java, Kalimantan, Maluku), Papua New Guinea, the Pacific Islands, Australia.

Ecology. Epiphytic or lithophytic in lowland and montane forests. Threat: Least Concern.

Didymoglossum mindorense (Christ) K.Iwats., Blumea 51(2): 236. 2006.

BEL: Pipeline road, *Edwards 985*. **BRM**: Lumapas, Kpg Dadap, *Edwards 2416*; Pengkalan Batu, Kpg Wasan, *Edwards 984*. **TEM**: Amo, Sg Belalong (Amo), *Edwards 2041*; Batu Apoi, Bkt Gelagas (Bkt Suang), *Simpson 2470*.

Distribution. Borneo (Brunei, Kalimantan, Sabah, Sarawak), Philippines, Papua New Guinea, Solomon Islands, and Australia.

Ecology. Mature tropical forests. Threat: Least Concern.

Didymoglossum sublimbatum (Müll.Berol.) Ebihara & K.Iwats., Blumea 51(2): 236. 2006.

TEM: Batu Apoi, Sg Temburong (Batu Apoi), *Edwards 2196*; Batu Apoi, Sg Temburong (Batu Apoi), *Edwards 2194*; Amo, Sg Belalong (Amo), *Edwards 2138*; G Retak, *Johns 6744*, *Johns 6750*.

Distribution. India, China, Indochina, Malaysia (Malay Peninsula, Sarawak, Sabah), Brunei, Indonesia (Sumatra, Java, Kalimantan), Papua New Guinea.

Ecology. Along forest streams on muddy soil. Threat: Least Concern.

15.5. Hymenophyllum Sm., Mém. Acad. Roy. Sci. (Turin) 5: 418. 1793.

Hymenophyllum acanthoides (Bosch) Rosenst., Bull. Jard. Bot. Buitenzorg, sér. 2, 2: 25. 1911.

BEL: Melilas, Ulu Ingei, *Sands MS5901*; Wasai Wong Kadir, *Edwards 2560*; Sg Teraja, *Edwards 718*. **TEM**: Amo, Bkt Belalong, *De Vogel 8996*; Amo, Ulu Belalong LP382, *Dransfield JD7351*; Amo, Sg Temburong, *Johns RJ7358*; Obud dam, *Edwards 2395*; Bkt Pagon, *Edwards & Cantley 735*; Bkt Retak, *Edwards 864*; G Pagon, *Booth P28*. **TUT**: Rambai, Ulu Tutong, *Johns RJ7584*.

Distribution. India, Indochina, Malaysia (Malay Peninsula, Sarawak, Sabah), Brunei, Indonesia (Sumatra, Java, Kalimantan, Maluku), Philippines.

Ecology. Shaded humid areas in mature forests. Threat: Least Concern.

Hymenophyllum blandum Racib., Pteridoph. Buitenzorg 20. 1898.

TEM: Amo, Bkt Retak, *Edwards 826*.

Distribution. Taiwan, Thailand, Malaysia (Malay Peninsula, Sarawak, Sabah), Brunei, Indonesia (Sumatra, Java, Lesser Sunda Islands, Kalimantan, Sulawesi, Maluku), Philippines, and New Guinea.

Ecology. Lithophyte in shaded forest areas. Threat: Rare in Brunei.

Hymenophyllum cardunculus C.Chr., Mitt. Inst. Hamburg 7: 144. 1928.

TEM: Amo, Sg Temburong, *Johns RJ7409*. **TUT**: Rambai, Ulu Tutong, *Johns RJ7512*.

Distribution. Malaysia (Sabah, Sarawak), Brunei, Indonesia (Sumatra, Kalimantan, Maluku), Philippines.

Ecology. In lowland forest. Threat: Least Concern.

Notes

The specimen was first classified as *H. acanthoides* and later as *H. cardunculus*. More research is needed to confirm this species in Brunei.

Hymenophyllum denticulatum Sw., J. Bot. (Schrader) 1800(2): 100. 1801.

TEM: Amo, Bkt Retak, *Edwards 864*; Amo, G Pagon, *Coode MC7599*; Amo, Bkt Retak, *Wong WKM914*, *Wong WKM s.n.*; Amo, Bkt Retak, *Johns RJ6584*; Batu Apoi, FSC, *Edwards 2457*; *Samhan SN18*; Bkt Belalong, *Edwards 2322*; Obud dam site, *Edwards 2396*. **TUT**: Rambai, Ulu Tutong, *Johns RJ7496*.

Distribution. Sri Lanka, India, China, Taiwan, Japan, Indochina, throughout Malesia, to Fiji.

Ecology. In mossy montane forest on rocks and trunks. Threat: Least Concern.

Hymenophyllum digitatum (Sw.) Fosberg, Smithsonian Contr. Bot. 45: 1. 1980.

(=) *Trichomanes dichotomum* Kunze, Bot. Zeitung (Berlin) 5: 302 (nomen). 1847.; Bosch. Hym. Jav. 22, t. 16. 1861. 1847.

TUT: Sg Ingei, *Edwards 2394*; Rambai, Ulu Tutong, *Johns RJ7506*.

Distribution. Tanzania, West Indian Ocean Islands, Taiwan, Indochina, Malaysia (Malay Peninsula, Sabah), Indonesia (Sumatra, Java, Lesser Sunda Islands, Kalimantan, Maluku, Indonesian New Guinea), Philippines, Papua New Guinea, Micronesia, Polynesia and Australia.

Ecology. Humid sites in mature dipterocarp forests. Threat: Rare in Brunei.

Hymenophyllum edentulum (Bosch) C.Chr., Index Filic.: 360. 1905.

(=) *Hymenophyllum bakeri* Copel., Sarawak Mus. J. 2. 309. 1917.

BEL: Sg Teraja, *Edwards 778*. **TEM**: Amo, Bkt Retak, *Wong s.n.*; Amo, Bkt Retak, *Edwards 830*; Amo, Bkt Retak, *Wong WKM906*; Amo, Bkt Retak, *Johns RJ7356*, Amo, Bkt Retak, *Sands MS5553*; Amo, Bkt Retak, *Johns RJ7360*; Amo, Bkt Retak, *Johns RJ7241*; Amo, Bkt Retak, *Johns RJ7350*; Bkt Pagon, *Edwards & Cantley 736*.

Distribution. India, Sumatra, Malay Peninsula, Borneo (Brunei, Sarawak), and the Philippines.

Ecology. In mature lowland forests. Threat: Rare in Brunei.

Hymenophyllum holochilum (Bosch) C.Chr., Index Filic. fasc. 6: 362. 1905.

TEM: Amo, Sg Temburong, *Johns RJ7177*; Sg Belalong, *Edwards 963*; Bkt Belalong ridge, *Edwards 2208*; Bkt Patoi, *Edwards 2271*, *Edwards 2273*.

Distribution. Taiwan, Thailand, throughout Malesia, to the Solomon Islands, Vanuatu, Fiji, New Caledonia, and Australia.

Ecology. Epiphyte in lowland to submontane forests. Threat: Rare in Brunei.

Hymenophyllum hosei Copel., Philipp. J. Sci., C 12: 46. 1917.

TEM: Amo, Sg Belalong (Amo), *Edwards 963*, *Wong WKM1331*; Amo, Sg Belalong (Amo), *Wong WKM1336*; Amo, Batu Apoi FR (K Belalong FSC), *Edwards 2089*; Amo, Batu Apoi FR (K Belalong FSC), *Edwards 2088*; Amo, Batu Apoi FR (K Belalong FSC), *Edwards 2042*; Amo, Sg Belalong (Amo), *Edwards 963*; Batu Apoi, Sg Temburong-Machang, *Wong WKM1937*; Amo, Sg Belalong (Amo), *Johns RJ6996*; Batu Apoi, Bkt Gelagas (Bkt Suang), *Simpson 2439*; Amo, Sg Temburong, *Johns RJ7418*; Amo, Sg Temburong, *Johns RJ7240*; Amo, Sg Temburong, *Johns RJ7420*; Amo, Sg Temburong, *Johns RJ7284*; Amo, Sg Temburong, *Johns RJ7229*; Batu Apoi, Sg Temburong (Headwaters), *Johns RJ7232*; Batu Apoi, Sg Temburong (Headwaters), *Johns RJ7242*; Batu Apoi, Sg Temburong (Headwaters), *Johns RJ7355*; Batu Apoi, Sg Temburong (Headwaters), *Johns RJ7204*; Batu Apoi, Sg Temburong (Headwaters), *Johns RJ7202*; Batu Apoi, Sg Temburong (Headwaters), *Johns RJ7132*; Batu Apoi, Sg Temburong (Headwaters), *Johns RJ7408*; Belalong, FSC, *Dancák 88A*; Amo, Bkt Retak, *Johns RJ6604*; Sg Sitam camp FSC, *Edwards 2042*; Sg Enkiang, *Edwards 2088*, *Edwards 2089*.

Distribution. Borneo (Brunei, Kalimantan, Sabah, Sarawak), Maluku (Seram).

Ecology. In lowland forest, near rocky streams. Threat: Least Concern.

Hymenophyllum lobbii T.Moore ex Bosch, Ned. Kruidk. Arch. 5(3). 176. 1863.

TEM: Amo, Bkt Belalong, *Edwards 2209*, *Edwards 2210*; Amo, Bkt Retak, *Johns RJ6539*; Amo, Bkt Retak, *Johns RJ6530*; Amo, Ulu Belalong, *Coode MC7835*.
Distribution. Sumatra, Borneo (Brunei, Kalimantan, Sabah, Sarawak), Australia.

Ecology. Lowland forests. Threat: Rare in Brunei.

Hymenophyllum pachydermicum Ces., Atti Accad. Sci. Fis. Mat. Napoli 7(8): 8. 1876.

TEM: Amo, Sg Temburong, *Coode MC6614*; Sg Belalong, *Edwards 2092*; Amo, Bkt Retak, *Johns RJ6532*; Amo, Bkt Belalong, *De Vogel 9018*, *Dransfield SD1247*, *Dransfield SD1248*; Batu Apoi, Sg Temburong (Headwaters), *Johns RJ7232*; Batu Apoi, Sg Temburong (Headwaters), *Johns RJ7242*; Batu Apoi, Sg Temburong (Headwaters), *Johns RJ7355*; Batu Apoi, Sg Temburong (Headwaters), *Johns RJ7244*; Bkt Retak, *Edwards 863*; Sg Temburong, *Edwards 2216*.

Distribution. Borneo (Brunei, Sabah, Sarawak), Indonesia (Sumatra, Java, Kalimantan, Sulawesi, Maluku), Philippines, New Guinea.

Ecology. In lowland forests, on stream boulders. Threat: Least Concern.

Hymenophyllum pallidum (Blume) Ebihara & K.Iwats., Blumea 51(2): 232. 2006.

(=) *Hymenophyllum album* (Blume) Parris, Fern Gaz. 20(7): 305. 2018.

TEM: Amo, Bkt Retak, *Johns RJ6600*; Amo, Bkt Retak, *Johns RJ6583*; Amo, Bkt Retak, *Wong WKM907*, *Wong WKM s.n.*; Amo, Sg Temburong, *Johns RJ7370*; Amo, Bkt Retak, *Johns RJ6570*, *Edwards 832* [these samples were identified as *Pleuromanes pallidum*]; Batu Apoi, Sg Temburong (Batu Apoi), *Edwards 2195*; Amo, G Pagon ridge, *Wong WKM1862*.

Distribution. Sri Lanka, India, China, Indochina, throughout Malesia to Polynesia and Australia.

Ecology. On tree trunks along rivers in lowland and montane forests. Threat: Least Concern.

Hymenophyllum palmatifidum (Müll.Berol.) Ebihara & K.Iwats., Taxon 53(4): 941. 2004.

BEL: Melilas, Bkt Batu Patam (Ulu Ingei), *Dransfield SD968*.
TEM: Bkt Retak, *Edwards 827*; Amo, Bkt Retak, *Johns RJ6669*; Amo, Bkt Retak, *Johns RJ6641*; Amo, Bkt Retak, *Johns RJ6567*; Amo, Bkt Retak, *Johns RJ6535*; Batu Apoi, Bkt Gelagas (Bkt Suang), *Simpson 2314*; Amo, Bkt Retak, *Wong WKM908*; Amo, Bkt Retak, *Wong WKM s.n.*

Distribution. Taiwan, Malaysia (Malay Peninsula, Sarawak, Sabah), Brunei, Indonesia (Sumatra, Java, Lesser Sunda Islands, Kalimantan, Maluku, Indonesian New Guinea) and Papua New Guinea.

Ecology. Epiphyte in montane areas between 1500–2500 m a.s.l. Threat: Least Concern.

Hymenophyllum penangianum Matthew & Christ., J. Linn. Soc., Bot. 39: 214, 1909.

TEM: Bkt Belalong, FSC, *Edwards 2321*.

Distribution. Malay Peninsula (Penang), Borneo (Brunei, Kalimantan, Sabah, Sarawak).

Ecology. In mature dipterocarp forests. Threat: Rare in Brunei.

Hymenophyllum pilosissimum C.Chr., Gard. Bull. Straits Settlem. ser. 3, 7: 213. 1934.

TEM: Amo, Bkt Retak, *Johns RJ6640*.

Distribution. Taiwan, Thailand, Borneo (Brunei, Kalimantan, Sabah, Sarawak), Philippines, New Guinea.

Ecology. In lowland forests. Threat: Rare in Brunei.

Hymenophyllum polyanthos (Sw.) Sw., J. Bot. (Schrader) 1800(2): 102. 1801.

TEM: Labu, Bkt Patoi (Peradayan FR), *Edwards 882*; Amo, Sg Belalong (Amo), *Edwards 2090*. Amo, G Pagon ridge, *Wong WKM1901*; Bkt Patoi, *Edwards 2270*.

Distribution. Throughout the tropics and subtropics, and Japan.

Ecology. Near streams and in forests. A very common and morphologically-variable species. Threat: Least Concern.

15.6. Trichomanes L., Sp. Pl.: 1097. 1753.

Trichomanes superbum Backh., Nursery Cat. (Backhouse of York) 1861: 15. 1861.

TUT: Ulu Tutong, *Johns RJ7603*; Bkt Bahak, *Johns RJ7018*.

Distribution. Malaysia (Malay Peninsula, Sarawak), Brunei, Indonesia (Sumatra, Kalimantan).

Ecology. In mature tropical forests. Threat: Rare in Brunei.

15.7. Vandenboschia Copel., Philipp. J. Sci. 67: 51. 1938.

Vandenboschia maxima (Blume) Copel., Philipp. J. Sci. 67(1): 54. 1938.

TEM: Amo, Bkt Retak, *Wong WKM879*; Amo, Bkt Retak, *Wong WKM883*; Labu, Bkt Patoi (Peradayan FR), *Edwards 892*.

Distribution. Japan, Taiwan, Indochina, throughout Malesia, and the Pacific Islands.

Ecology. Along rivers, on rocks, from lowlands to montane forests. Threat: Least Concern.

Family 16. HYPODEMATIACEAE

16.1. Leucostegia C.Presl, Tent. Pterid.: 94. 1836.

Leucostegia pallida (Mett.) Copel., Philipp. J. Sci. 34: 252. 1927.

TEM: Amo, Sg Temburong, *Johns RJ7133*, *Johns RJ7388*.
Distribution. Myanmar, Malaysia (Malay Peninsula, Sarawak), Brunei, Indonesia (Sumatra, Kalimantan, Maluku), the Philippines, Papua New Guinea, Micronesia, Polynesia.

Ecology. Epiphytic in shaded areas of mature tropical forests, sometimes growing on trunks of Cyatheaceae; lowlands below 600 m a.s.l. Threat: Least Concern.

Family 17. LINDSAEACEAE

17.1. Lindsaea Dryand. ex Sm., Mém. Acad. Roy. Sci (Turin) 5: 413. 1793.

Lindsaea borneensis Hook. ex Baker, Syn. Fil. (Hooker & Baker) 107. 1867. (Fig. 28).

BEL: Melilas, Bkt Batu Patam (Ulu Ingei), *Wong WKM1049*; Labi, Ulu Sg Mendaram, *Ariffin et al. BRUN22791*; Wasai Wong Kadir, *Edwards 2568*; Andulau, *Edwards 908*; Labi hills, *Edwards 791*; Sg Ingei, *Edwards 2353*; Labi, Wasai Mendaram, *Dransfield SD932*; Labi, Bkt Teraja, *Johns RJ6880*, *Sands MS5470*; Melilas, Sg Ingei, *Edwards 2352*; Badas forest reserve, *Wong WKM2;* Melilas, Batu Melintang, *Kessler PK390*; Bkt Teraja, *Cicuzza 2674*. **BRM**: Sg Akar, *Edwards 515*. **TEM**: Labu, Bkt Patoi (Peradayan FR), *Edwards 876*; Amo, Bkt Lutut, *Ariffin et al. BRUN20787*, *Wong WKM1362*; Amo, Batu Apoi FR (K Belalong FSC), *Nielsen 1068*; Bkt Belalong, *Edwards 2315*; Bkt Patoi, *Edwards 2262*, *Edwards 873*; Sg Sitam, *Edwards 986*; Batu Apoi, Bkt Gelagas (Bkt Suang), *Simpson 2226*; Amo, Bkt Belalong, *Edwards 2313*; Rambai, Amo, Ulu Belalong, *Idris et al. BRUN16696*; Amo, Bkt Tudal, *Idris et al. BRUN15808*; Amo, Ulu Temburong (Wong Nguan), *Coode MC6678*; Bangar, Pekan Bangar, *Ashton A79*; Amo, Bkt Belalong; *Dransfield SD1270*; Liang, Andulau FR (Sg Liang), *Edwards 908*; Bkt Belalong, *Poulsen ADP93*; Amo, Belalong KBFSC, *Cicuzza 2718*; Amo, Belalong KBFSC, *Cicuzza 2723*; Amo, Belalong KBFSC, *Cicuzza 2726*. **TUT**: Benutan Lake, *Edwards 2332*; Ulu Tutong, *Johns RJ7606*; Telisai Pasir Puti, *Cicuzza 2526*; Kago dam, *Cicuzza 2645*; Kago dam, *Cicuzza 2654*.

Distribution. Malaysia (Malay Peninsula, Sarawak, Sabah), Brunei, Singapore, Indonesia (Kalimantan).

Ecology. In mature mixed dipterocarp forest, from lowlands to mid-montane forests. Threat: Least Concern.

Figure 28. Lindsaeaceae. *Lindsaea borneensis* (Photo D. Cicuzza).

Lindsaea bouillodii Christ, Notul. Syst. (Paris) 1(2): 59. 1909.

TUT: Rambai, Sg Medit, *Simpson 2626*; Sg Padang, Jln Merimbun, *Edwards 659*.

Distribution. Indochina, Philippines, Malaysia (Malay Peninsula, Sarawak, Sabah), Brunei, Indonesia (Java, Kalimantan, Sulawesi).

Ecology. Terrestrial, in forests between 300–1400 m a.s.l. Threat: Least Concern.

Lindsaea carvifolia K.U.Kramer, Blumea 15: 569. 1968.

TEM: Amo, G Pagon, *Coode MC7541*, *Booth P5*, *Booth P6*, *Booth P17*; Amo, G Pagon, *Wong WKM1777*; Amo, G Pagon Periok, *Ashton A264*.

Distribution. Malaysia (Sarawak, Sabah), Brunei, Indonesia (Kalimantan, Sulawesi, Maluku).

Ecology. Epiphytic, in forests between 500–1700 m a.s.l. Threat: Least Concern.

Lindsaea crispa Baker, J. Bot. 17: 39 1879.

TEM: Amo, Bkt Retak, *Edwards 851*.

Distribution. Endemic to Borneo (Brunei, Kalimantan, Sabah, Sarawak).

Ecology. In forests between 1000–1600 m a.s.l. Threat: Rare in Brunei.

Lindsaea cultrata (Willd.) Sw., Syn. Fil. (Swartz) 119. 1806.

BEL: Melilas, Bkt Batu Patam (Ulu Ingei), *Dransfield SD941*. **TEM**: Amo, Batu Apoi FR (K Belalong FSC), *Poulsen ADP128*, *Poulsen ADP343*; Amo, K Belalong FSC; *Edwards 2168*, *Edwards 2343*; Amo, G Pagon, *Liaw 18*; Amo, Belalong, FSC, *Cicuzza 2605*; Amo, Belalong, FSC, *Cicuzza 2607*.

Distribution. India, Sri Lanka, China, Thailand, throughout Malesia except New Guinea, and the Solomon Islands.

Ecology. In mature forests to 1300 m a.s.l. Threat: Least Concern.

Lindsaea divergens Hook. & Grev., Icon. Filic.: t. 226. 1831.

BEL: Labi, Bkt Teraja, *Johns RJ6838*, *Simpson 2050*; *Ariffin et al. BRUN23236*; Melilas, Bkt Batu Patam (Ulu Ingei), *Dransfield SD940, Wong WKM1055*; Melilas, Sg Ingei, *Edwards 2373*; Kargu dam, *Edwards 2398*; Bkt Teraja, *Cicuzza 2682*. **BRM**: Jln Kebangsaan, *Edwards 587*; Berakas, near coast, *Edwards 458*. **TEM**: Amo, Batu Apoi FR (K Belalong FSC), *Poulsen ADP271*. **TUT**: Rambai, Bkt Bahak, *Coode MC6999*.

Distribution. Thailand, Malaysia (Malay Peninsula, Sarawak, Sabah), Brunei, Singapore, Indonesia (Sumatra, Kalimantan), Philippines.

Ecology. Terrestrial, in forests from sea level to 800 m a.s.l. Threat: Least Concern.

Lindsaea doryphora K.U.Kramer, Blumea 15: 566. 1968. (Fig. 29).

BEL: Melilas, Ulu Ingei, *Sands MS5932*; Melilas, Bkt Batu Patam (Ulu Ingei), *Wong WKM1026*; Melilas, Sg Ingei, *Suhaili SZ4*; Labi, Labi Hills FR, *Ariffin et al. BRUN22551*; Labi, Bkt Teraja, *Johns RJ6841*, *Ariffin et al. BRUN23234*; Bkt Sawat, Jln Merangking-Buau, *Niga NN249*; Wasai Wong Kadir, *Edwards 2549*, *Cicuzza 2584*, *Cicuzza 2667*. **TEM**: Amo, Sg Temburong, *Johns RJ7249*; Amo, Batu Apoi FR (K Belalong FSC), *Poulsen ADP341*; Amo, Ulu Belalong, *Idris et al. BRUN16683*; Amo, Ulu Temburong (Wong Nguan), *Wong WKM1731*; Batu Apoi, Bkt Gelagas (Bkt Suang), *Simpson 2479*; K Belalong, FSC, *Tagane B568*; Amo, Belalong FSC, *Cicuzza 2627*. **TUT**: Rambai, Bkt Bahak; *Coode MC7092*; Sg Apan, *Edwards 2405*; Benutan Lake, *Edwards 2240*.

Distribution. Thailand, Malaysia (Malay Peninsula, Sarawak, Sabah), Brunei, Singapore, Indonesia (Sumatra, Java, Kalimantan), Philippines.

Figure 29. Lindsaeaceae. *Lindsaea doryphora* (Photo D. Cicuzza).

Ecology. In swamp forests to 1300 m a.s.l. Threat: Least Concern.

Lindsaea ensifolia Sw., J. Bot. (Schrader) 1800(2): 77. 1801.

BEL: Labi, Bkt Teraja, *Johns RJ6878*, *Edwards 710*; Sg Mendaram, *Ariffin et al. BRUN22799*; Sg Rampayoh, *Leong 16*; Seria, Badas FR, *Wong WKM8*; Labi, Kpg Teraja, *Wong WKM987*. **BRM**: Kota Batu, Kpg Kota Batu, *Johns RJ6798*; Jerudong beach, *Edwards 524*; Crocodile beach, *Edwards 609*; Jln Tasek, *Edwards 455*; Sultan Bolkiah's tomb, Kota Batu, *Edwards 449*; Jln Tg Batu, *Edwards 2307*. **TEM**: Labu, Bkt Patoi (Peradayan FR), *Edwards 871*, *Edwards 2248*, *Edwards 871*. **TUT**: Tg Maya, Kpg Bkt Udal, *Voeks RV495*; Sg Layong, *Edwards 473*; Jln Tutong, *Edwards 460*; Tasek Merimbun, *Edwards 596*; Merimbun Lake, *Cicuzza 2539*; Rambai, Sg Medit, *Simpson 2526*.

Distribution. Old World tropics from the East African coast to Hawaii.

Ecology. Terrestrial or lithophytic, in wet or dry places; sea level to 1000 m a.s.l. Threat: Least Concern.

Lindsaea heterophylla Dryand., Trans. Linn. Soc. London 3: 41, pl. 8. 1797.

TUT: Sg Padang, *Edwards 658*.

Distribution. West Indian Ocean Islands, India, Sri Lanka, China, Japan, Indochina, Malaysia (Malay Peninsula, Sarawak, Sabah), Brunei, Indonesia (Sumatra, Java, Maluku), Philippines.

Ecology. Along rivers and forest streams in mature forests. Threat: Rare in Brunei.

Lindsaea integra Holttum, Gard. Bull. Straits Settlem. 5: 67. 1930.

BEL: Labi, Sg Rampayoh, *Sands MS5996*; Melilas, Bkt Batu Patam (Ulu Ingei), *Wong WKM1014*; Jln Sg Akar, *Edwards 520*. **TEM**: Batu Apoi, Sg Temburong (Batu Apoi), *Edwards 2157*; Amo, Batu Apoi FR (K Belalong FSC), *Poulsen ADP344*; Amo, Sg Temburong, *Coode MC6490, Hussain s.n.*; Amo, Bkt Belalong, *Dransfield SD1212*.

Distribution. Thailand, Malaysia (Malay Peninsula, Sarawak, Sabah), Brunei, Indonesia (Sumatra, Kalimantan).

Ecology. In forests, often along streams, between 100–1200 m a.s.l. Threat: Least Concern.

Lindsaea lobata Poir., Encycl. Suppl. 3(2): 448. 1814.

TEM: Amo, Bkt Belalong, *Edwards 2316*.

Distribution. China (Hainan), Vietnam, Malaysia (Sabah, Sarawak), Brunei, Indonesia (Sumatra, Java, Lesser Sunda Islands, Kalimantan, Sulawesi, Maluku), Philippines, Papua New Guinea, Micronesia.

Ecology. Terrestrial or at the base of trees in primary forests, 50–1800 m a.s.l. Threat: Least Concern.

Lindsaea lucida Blume, Enum. Pl. Javae 2: 216–217. 1828. (Fig. 30).

BEL: Labi, Sg Teraja, *Edwards 803*, *Edwards 2540*, *Edwards 775*; Labi, Sg Rampayoh, *Sands MS6007*; Melilas, Ulu Belait, *Sands MS5887*. **TEM**: Batu Apoi, Sg Temburong (Batu Apoi), *Edwards 934*; Amo, Batu Apoi FR, *Sands MS5787*; Batu Apoi, Kpg Selapon, *Dransfield SD1161*; Amo, Sg Belalong (Amo), *Johns RJ6980, Johns RJ7001, Johns RJ7016*, *Middleton DJM752*; Amo, Bkt Retak, *Johns RJ6692*; Amo, Sg Temburong, *Johns RJ7171*, *Johns RJ7219*, *Sands MS5550*, *Wong WKM487*; Amo, Bkt Belalong, *Edwards 813*; Amo, Batang Duri, *Edwards 2393*, *Schatz GS3291*; Amo, K Belalong, *Ashton A9*; Amo, Batu Apoi FR (K Belalong FSC), *Edwards 997*, *Edwards 2018*, *Nielsen 1042*, *Poulsen ADP72*; Amo, Ulu Temburong (Wong Nguan), *Coode MC6490*; Sg Sitam, *Edwards 997*; Sg Anak Babi, *Wong WKM3437*; Amo, Batu Apoi, *Lee 1047*. **TUT**: Rambai, Ulu Tutong, *Johns RJ7518*, *Johns RJ7550*; Rambai, Sg Tutong (Belabau), *Coode MC6370*; Ladan hills, *Edwards 955*.

Distribution. India, Bhutan, Bangladesh, China, Japan, Indochina, Malaysia (Malay Peninsula, Sarawak, Sabah), Brunei, Indonesia (Sumatra, Java, Kalimantan, Maluku), Philippines, Papua New Guinea, Micronesia.

Ecology. Terrestrial or on rocks, 400–1600 m a.s.l. Threat: Least Concern.

Figure 30. Lindsaeaceae. *Lindsaea lucida* (Photo D. Cicuzza).

Lindsaea oblanceolata Alderw., Bull. Jard. Bot. Buitenzorg, sér. 2, 23: 15. 1916. (Fig. 31).

BEL: Bkt Teraja, *Cicuzza 2679*. **TEM**: Amo, Bkt Belalong, *Dransfield SD1252*, *Wong s.n.*; Amo, Bkt Retak, *Johns RJ6525, Johns RJ6601*, *Johns RJ6655*, *Wong WKM405, Wong WKM772*, *Edwards 829, Edwards 852*; Amo, G Pagon, *Coode MC7498, Coode MC7606*, *Wong WKM1791*, *Booth P10*; Amo, Bkt Tudal, *Idris et al. BRUN15811*; G Pagon, *Liaw 32*. **TUT**: Lamunin, Ladan Hills FR, *Idris et al. BRUN17663*, Kago dam, *Cicuzza 2647*, Bkt Teraja, *Cicuzza 2679*.

Distribution. Indochina, Malaysia (Malay Peninsula, Sarawak, Sabah), Brunei, Indonesia (Sumatra, Java, Kalimantan, Maluku), Philippines.

Ecology. Epiphytic, 800–1800 m a.s.l. Threat: Least Concern.

Lindsaea obtusa Hook., Sp. Fil. [W. J. Hooker] 1: 224. 1846.

TEM: Amo, Bkt Retak, *Wong WKM884*, *Liaw 42*.

Distribution. Andaman Islands, Taiwan, throughout Malesia, to Micronesia and Australia.

Figure 31. Lindsaeaceae. *Lindsaea oblanceolata* (Photo KM. Wong).

Ecology. Lowland primary forests to 2000 m a.s.l. Threat: Least Concern.

Lindsaea orbiculata (Lam.) Mett., Ann. Mus. Bot. Lugduno-Batavi 4(9): 279. 1869.

BRM: Berakas, Kpg Tanah Jambu, *Edwards 2418*.

Distribution. India, China, Japan, Indochina, and throughout Malesia except New Guinea.

Ecology. At forest margins or ravines. Threat: Least Concern.

Lindsaea ovata J.Sm., Sp. Fil. [W. J. Hooker] 1: 204, t.64A. 1846.

BEL: Labi, Labi Hills FR, *Idris et al. BRUN18755*; Melilas, Bkt Batu Patam (Ulu Ingei), *Dransfield SD955*.

Distribution. Malaysia (Malay Peninsula, Sarawak, Sabah), Brunei, Singapore, Indonesia (Sumatra), Philippines.

Ecology. Terrestrial or lithophytic, from near sea level to 1000 m a.s.l. Threat: Least Concern.

Lindsaea parallelogramma Alderw., Bull. Jard. Bot. Buitenzorg, sér. 3, 5: 212. 1922. (Fig. 32).

BEL: Melilas, Ulu Ingei, *Sands MS5921, Wong s.n*; Melilas, Sg Ingei, *Edwards 2350*; Melilas, Bkt Batu Patam (Ulu Ingei), *Dransfield SD939*; Melilas, Batu Melintang, *Wong WKM670*; Labi, Sg Teraja, *Edwards 802*; Labi, Bkt Teraja, *Johns RJ6849, Simpson 2085*; Labi, Kpg Teraja, *Sands MS5693*; Liang, Badas (Sg Liang), *Ashton A153*; Sg Mendaram, *Ariffin et al. BRUN23241*. **TEM**: Amo, Sg Temburong, *Johns RJ7227*, *Wong WKM466*; Amo, Ulu Temburong (Wong Nguan), *Coode MC6677*, *Coode MC6678*; Amo, Bkt Belalong, *Dransfield SD1210*, *Wong WKM1354*, *Wong WKM1487*, *Edwards & Cantley 812*; Amo, Bkt Retak, *Wong WKM880*; Amo, Batu Apoi FR (K Belalong FSC), *Poulsen ADP71*, *Poulsen ADP342*, *Edwards 2003*, *Edwards 2112*; Bangar, Pekan Bangar; *Sands MS5637*; Sg Babi, *Edwards 2155*; G Pagon, *Liaw 13*, *Liaw 8*, *Liaw 7*. **TUT**: Rambai, Ulu Tutong, *Paing s.n.*, *Kirkup DK500*; Lamunin, Ladan Hills FR, *Coode MC6428, Johns RJ7109*.

Distribution. Thailand, Malaysia (Malay Peninsula, Sarawak, Sabah), Brunei, Singapore, Indonesia (Sumatra, Java, Kalimantan, Maluku, Indonesian New Guinea), Papua New Guinea.

Ecology. Terrestrial; lowlands to 1200 m a.s.l. Threat: Least Concern.

Figure 32. Lindsaeaceae. *Lindsaea parallelogramma* (Photo D. Cicuzza).

Lindsaea parasitica (J.Roxb. ex Griff.) Hieron., Hedwigia 62: 14. 1920.

BEL: Bkt Sawat, Merangking-Buau, *Coode MC7696*; Bkt Sawat, Sg Sindum, *Ariffin et al. BRUN21981*, *Ariffin et al. BRUN24623*; Liang, Sg Liang Arboretum FR, *Junaidi et al. BRUN18910*; Liang, Andulau FR (Sg Liang), *Azlan et al. BRUN19791*; Melilas, Sg Ingei, *Edwards 2378*; Sg Liang, Arboretum, *Edwards 479*, *Edwards 480*, *Edwards 481*, *Edwards 482*.
TEM: Amo, G Pagon, *Liaw 19, Liaw 43*.

Distribution. Thailand, Malaysia (Malay Peninsula, Sarawak, Sabah), Brunei, Singapore, Indonesia (Sumatra, Kalimantan, Maluku).

Ecology. Epiphytic; lowlands to 1100 m a.s.l. Threat: Least Concern.

Lindsaea repens (Bory) Thwaites, Enum. Pl. Zeyl. 388. 1864.

BEL: Kargu dam, *Edwards 2399*. **BRM**: Sg Dolhakim, *Edwards 576*; P Berambang, *Edwards 581*. **TEM**: Amo, Bkt Retak, *Johns RJ6656*.

Distribution. West Indian Ocean Islands to Hawaii.

Ecology. Epiphytic on tree trunks. Lowlands to montane forests at 1800 m a.s.l. Threat: Least Concern.

Lindsaea rigida J.Sm. ex Hooker., Sp. Fil. [W. J. Hooker] 1: 217, t. 63. 1846.

TEM: Amo, Bkt Retak, *Johns RJ6602, Edwards 824*, *Wong WKM732*; Amo, G Pagon Periok, *Ashton A275*; Amo, Bkt Retak, *Wong WKM909*.

Distribution. Malaysia (Malay Peninsula, Sarawak, Sabah), Brunei, Indonesia (Sumatra, Kalimantan. Sulawesi, Maluku, Indonesian New Guinea), Philippines, Papua New Guinea, the Solomon Islands to Tahiti.

Ecology. Epiphytic, 1000–2000 m a.s.l. Threat: Least Concern.

17.2. Tapeinidium (C.Presl) C.Chr., Index Filic.: 631. 1906.

Tapeinidium gracile (Blume) Alderw., Malayan Ferns 315, 1909.

BRM: Kpg Dadap walk, *Edwards 2275*.

Distribution. Vietnam, Borneo (Brunei, Sarawak), Indonesia (Java, Lesser Sunda Islands, Sulawesi, Maluku), Philippines.

Ecology. On rocky, humid sites, along streams. Threat: Rare in Brunei.

Tapeinidium luzonicum (Hook.) K.U.Kramer, Blumea 15: 552. 1968.

BEL: Labi, Bkt Teraja, *Sands MS5469*. **TEM**: Batu Apoi, Sg Temburong (Batu Apoi), *Edwards 2158, Lee 1046*, *Poulsen ADP70*; Amo, G Pagon, *Coode MC7509*, *Coode MC7607*, *Ariffin ARK138*; Amo, Bkt Tudal, *Idris et al. BRUN15814*; Amo, Bkt Retak, *Edwards 850*, *Johns RJ6510*; Amo, Batu Apoi FR (K Belalong FSC), *Edwards 2013*, *Edwards 2127*, *Nielsen 1037*, *Poulsen ADP70*, *Poulsen ADP350*; Amo, K Belalong, *Ashton A104*, *Dransfield SD991*; Amo, Sg Temburong, *Johns RJ7129*, *Johns RJ7216*, *Wong WKM486*; Amo, Sg Belalong (Amo), *Edwards 2120*, *Johns RJ6922*; Amo, Ulu Temburong (Wong Nguan), *Coode MC6503*; Amo, Bkt Belalong, *Dransfield SD1250*, *Edwards 2311*; Sg Temburong, Sg Injiing, *Samhan SN15*; Sg Temburong, Sg Apan, *Samhan SN14*. **TUT**: Rambai, Bkt Bedawan (Ulu Tutong), *Idris et al. BRUN17650*; Rambai, Ulu Tutong, *Johns RJ7544*.

Distribution. Thailand, Malaysia (Malay Peninsula, Sarawak, Sabah), Brunei, Indonesia (Sumatra, Java, Kalimantan, Sulawesi, Maluku), Philippines.

Ecology. Terrestrial in forests; between 600–1500 m a.s.l. Threat: Least Concern.

Tapeinidium oligophlebium (Baker) C.Chr., Index Filic. 631. 1906.

TEM: G Retak, *Johns RJ6629*.

Distribution. Endemic to Borneo (Brunei, Kalimantan, Sarawak).

Ecology. In montane forests. Threat: Rare in Brunei.

Tapeinidium pinnatum (Cav.) C.Chr., Index Filic. 213. 1905.

TEM: Amo, G Pagon, *Liaw 35*.

Distribution. India, Taiwan, Japan, Indochina, Singapore, Malaysia (Malay Peninsula, Sarawak, Sabah), Brunei, Indonesia (Sumatra, Java, Kalimantan, Sulawesi), Philippines.

Ecology. In montane forests. Threat: Rare in Brunei.

Family 18. LOMARIOPSIDACEAE

18.1. Cyclopeltis J.Sm., Bot. Mag. 72(Companion): 36. 1846.

Cyclopeltis crenata (Fée) C.Chr., Index Filic., Suppl. 3, 64. 1934.

TEM: Amo, Sg Temburong, *Johns RJ7373*; Amo, Batu Apoi FR (K Belalong FSC), *Poulsen ADP178*.

Distribution. China, Indochina, Malaysia (Malay Peninsula, Sabah), Brunei, Indonesia (Sumatra, Java, Kalimantan, Sulawesi), Philippines.

Ecology. In pristine forest, usually in shady sites with mature and humid soil. Threat: Least Concern.

18.2. Lomariopsis Fée, Mém. Foug, 2. Hist. Acrostich: 10. 1845.

Lomariopsis lineata (C.Presl) Holttum, Novit. Bot. Univ. Carol. 9. 1968.

BEL: Sg Malayan, *Ariffin et al. BRUN23289*. **TEM**: Amo, Batu Apoi FR (K Belalong FSC), *Poulsen ADP126*; Sg Belalong, *Edwards 2102*. **TUT**: Lamunin, Ladan Hills FR, *Edwards 953*, *Edwards 970*.

Distribution. Indonesia, throughout Malesia except Papua New Guinea.

Ecology. Lowlands to 1200 m a.s.l. Threat: Least Concern.

Lomariopsis spectabilis (Kunze) Mett., Fil. Hort. Bot. Lips. 22. 1856.

BEL: Labi, Labi Hills FR, *Ariffin et al. BRUN22566*. **TEM**: Amo, Ulu Belalong, *Idris et al. BRUN16685*; Amo, Kerangan Meritam, *Idris et al. BRUN15280*; Batu Apoi, Bkt Gelagas (Bkt Suang), *Simpson 2462*; Kpg Bakok, *Cicuzza 2704*.

Distribution. Taiwan, Japan, Malaysia (Sarawak, Sabah), Brunei, Indonesia (Sumatra, Java, Lesser Sunda Islands, Kalimantan, Maluku) and Philippines.

Ecology. In mature and old secondary forests; lowlands to 1500 m a.s.l. Threat: Least Concern.

Family 19. LYGODIACEAE

19.1. Lygodium Sw., J. Bot. (Schrader) 1800(2): 7, 106. 1801.

Lygodium circinnatum (Burm.f.) Sw., Syn. Fil. 153. 1806. (Fig. 33).

BEL: Bkt Sawat, Jln Merangking-Buau, *Wong WKM375*; Labi, Bkt Teraja, *Johns RJ6886*. **BRM**: Mentiri, Jln Muara, *Edwards 2425*; Sg Teraja, *Edwards 2517*; Tasek Gorge, *Edwards 465*; Jln Tasek, *Edwards 466*. **TEM**: Amo, Batang Duri, *Forman LLF932*; Amo, Batu Apoi FR (K Belalong FSC), *Poulsen ADP133*; Amo, Batu Apoi FR (K Belalong FSC), *Edwards 2048*; Batu Apoi, Selapon (Bkt Beliton), *Wong WKM2012*; Labu, Bkt Patoi (Peradayan FR), *Edwards 899*, *Edwards 2255*. **TUT**: Lamunin, Benutan dam, *Edwards 2224*, *Edwards 459*; Rambai, Kpg Benutan, *Ariffin ARK67*; Rambai, Bkt Tangan, *Suzuki K13080*; Kpg Batang Mitus, *Edwards 2575*; Merimbun Lake, *Cicuzza 2539*.

Distribution. Sri Lanka, India, China, throughout Malesia to the Pacific Islands.

Ecology. A terrestrial climber. Found in open sites, gaps in primary forests, secondary forests, plantations and other disturbed sites; lowlands to 1000 m a.s.l. Threat: Least Concern.

Figure 33. Lygodiaceae. *Lygodium circinnatum* (Photo D. Cicuzza).

Lygodium longifolium (Willd.) Sw., J. Bot. (Schrader) 1801(2): 305. 1803.

BEL: Labi, Jln Labi, *Voeks RV385*. **BRM**: Kota Batu, Kpg Kota Batu, *Johns RJ6797*; Jln Sg Akar, *Edwards 759*; Jln Kota Batu, *Edwards 642*. **TUT**: Tg Maya, Kpg Bkt Udal, *Voeks RV498*.

Distribution. India, China, Malay Peninsula, Indonesia (Sumatra, Kalimantan, Sulawesi), Philippines.

Ecology. At forest margins, forest gaps, secondary forests, or plantations below 500 m a.s.l. Threat: Least Concern.

Lygodium microphyllum (Cav.) R.Br., Prodr. 162. 1810.

BEL: Bkt Sawat, Jln Labi (Bkt Sawat), *Idris et al. BRN15843*; K Belait, K Belait, *Niga NN342*; Sg Teraja, *Edwards 2545*. **BRM**: Kapok Kanan, *Grindrod JG/BR6*; Jln Gadong, *Edwards 432*. **TUT**: Tg Maya, Kpg Bkt Udal, *Voeks RV483*; Rambai, Tasek Merimbun, *Bernstein JHB221*, *Edwards 591*; Telisai, Pasir Puteh, *Johns RJ6786*; Ukong, Kpg Ukong, *Johns RJ7084*.

Distribution. Tropical and southern Africa, India, China, Japan, Thailand, throughout Malesia, Solomon Islands, New Caledonia and Australia. Naturalised in Southern USA.

Ecology. In secondary forests and plantations below 500 m a.s.l. Threat: Least Concern.

Lygodium salicifolium C.Presl, Tent. Pterid. 102. 1836.

BEL: Labi, Bkt Teraja, *Johns RJ6896*; Sg Teraja, *Edwards 2522*; Wasai Wong Kadir, *Edwards 2523*. **BRM**: Jln Tasek, *Edwards 454*. **TUT**: Lamunin, Benutan dam, *Edwards 2219*, *Edwards 470*; Rambai, Sg Medit, *Edwards 2219*, *Simpson 2563*, *Simpson 2621*; Rambai, Kpg Benutan, *Ariffin ARK60*; Jln Merimbun, *Edwards 661*, *Edwards 662*.

Distribution. India, China, Indochina, Malaysia (Malay Peninsula, Sarawak), Brunei, Indonesia (Sumatra, Java, Kalimantan), New Guinea, Micronesia.

Ecology. Forest margins and plantations; lowlands to 1000 m a.s.l. Threat: Least Concern.

Family 20. MARATTIACEAE

20.1. Angiopteris Adans., Fam. Pl. 2: 21. 1763.

Angiopteris evecta (G.Forst.) Hoffm., Commentat. Soc. Reg. Sci. Gott. 12: 29, t. 5. 1794.

BEL: Bkt Teraja, *Watu et al. BRUN19663*. **TUT**: Lamunin, Kpg Lamunin, *Edwards 739*.

Distribution. Madagascar, India, Sri Lanka, China, Japan, Indochina, throughout Malesia, Australia, Papua New Guinea, the Pacific Islands; naturalised in Hawaii and Central America.

Ecology. Along rivers and streams, in rocky habitats. Threat: Rare in Brunei.

Angiopteris palmiformis (Cav.) C.Chr., Dansk Bot. Ark. 9(3): 30, pl. 3. 1937.

TEM: Amo, G Pagon ridge, *Wong WKM1892*.

Distribution. Taiwan, Japan, Vietnam, Malaysia (Sabah), Brunei, Indonesia (Sumatra, Java, Maluku), Philippines.

Ecology. In montane forests. Threat: Rare in Brunei.

Angiopteris smithii Racib., Bull. Int. Acad. Sci. Cracovie 2: 54. 1902. (Fig. 34).

BEL: Labi, Kpg Labi, *Johns RJ6807*; Sg Teraja, *Edwards 684*; Sg Telingan waterfall, *Ariffin et al. BRUN23693*. **TEM**: Amo, Batu Apoi FR (K Belalong FSC), *Edwards 2103*; Batu Apoi, Sg Temburong-Machang, *Wong WKM1960*, *Edwards 2103*; Labu, Peradayan FR, *Johns RJ7047*; Bkt Patoi, *Edwards 897*.

Distribution. Malaysia (Sarawak, Sabah), Brunei, and Indonesia (Sumatra, Kalimantan).

Ecology. Along rivers in primary forests. Threat: Endangered.

Figure 34. Marattiaceae. *Angiopteris smithii* (Photo D. Cicuzza).

20.2. Christensenia Maxon, Proc. Biol. Soc. Washington 18: 239. 1905.

Christensenia aesculifolia (Blume) Maxon, Proc. Biol. Soc. Washington 18(50): 240. 1905. (Fig. 35).

BEL: Labi, Wasai Wong Kadir, *Johns RJ7433*; Labi, Kpg Teraja, *Ariffin et al. BRUN21112*; Labi, Wang Tebadak, *Azizi et al. BRUN23756*; Wasai Wan Kadir, *Cicuzza 2662*. **TEM**: Amo, Batu Apoi FR (K Belalong FSC), *Edwards 2184*, *Sands MS5847*, *Poulsen ADP113*; Amo, K Belalong, *Dransfield SD1015*; Amo, Sg Apan, *Ariffin et al. BRUN15746*; Amo, Sg Belalong (Amo); *Edwards 2101*; Amo, Sg Sibut, *Johns RJ6903*; Amo, Sg Temburong, *Johns RJ7154*, *Johns RJ7156*; Batu Apoi, Selapon (Bkt Beliton), *Wong WKM2069*; Sg Baki, *Hovenkamp BR007*; Sg Belalong, FSC, *Cicuzza 2579*; Kpg Bakok, *Cicuzza 2714*. **TUT**: Lamunin, Kpg Lamunin, *Edwards 753*; Benutan Lake, *Edwards 2230*, *Edwards 2233*; Lamunin, Sg Beruang, *Ariffin et al. BRUN23285*.

Distribution. India, China, Indochina, throughout Malesia, Solomon Islands.

Ecology. Along rivers in pristine forest, on muddy soil; lowlands to 1000 m a.s.l. Threat: Least Concern.

Figure 35. Marattiaceae. *Christensenia aesculifolia* (Photo D. Cicuzza).

20.3. Ptisana Murdock, Taxon 57: 744. 2008.

Ptisana sylvatica (Blume) Murdock, Taxon 57(3): 747. 2008. (Fig. 36).

TEM: Amo, Bkt Retak, *Wong WKM849*.

Distribution. Borneo (Brunei, Sabah, Sarawak), Java, Philippines.

Ecology. In primary forest, on humid soil and in ravines, between 400–1300 m a.s.l. Threat: Rare in Brunei.

Family 21. MATONIACEAE

21.1. Matonia R.Br., N.Wallich, Pl. Asiat. Rar. 1: 16. 1829.

Matonia foxworthyi Copel., Philipp. J. Sci., Bot. 3: 343, pl. 2. 1908.

TEM: Amo, G Pagon, *Wong WKM1769*, *Booth P23*; Amo, Bkt Retak, *Edwards 857*; Amo, G Pagon, *Ariffin ARK132*; Amo, Batu Apoi, *Ariffin et al. BRUN23433*.

Distribution. Malaysia (Malay Peninsula, Sarawak, Sabah), Brunei, Indonesia (Kalimantan, Maluku, Indonesian New Guinea), Philippines.

Figure 36. Marattiaceae. *Ptisana sylvatica* (Photo KM. Wong).

Ecology. On isolated mountain summits, open spaces, or forest margins. Threat: In Brunei, found only in Pagon mountain site.

Family 22. NEPHROLEPIDACEAE

22.1. Nephrolepis Schott, Gen. Fil. (Vindob.): t. 3. 1834.

Nephrolepis biserrata (Sw.) Schott, Gen. Fil. [Schott] ad t. 3. 1834.

BEL: K Belait, K Belait, *Ashton A16*; Labi, Sg Petai-Luagan Lalak, *Ariffin et al. BRUN20448*; Labi, Wasai Wong Kadir (= Wasai Rampayoh), *Johns RJ7434*; Sg Teraja, *Edwards 2526*; Seria, Badas, *Ashton A139*. **BRM**: Jln Residency, *Edwards 407*; JKR, grounds, *Edwards 495*. **TEM**: Amo, Sg Belalong (Amo), *Johns RJ6941*; Batu Apoi, Bkt Gelagas (Bkt Suang), *Simpson 2232*. **TUT**: Lamunin, Ladan Hills FR, *Johns RJ7097*; Tg Maya, Kpg Bkt Udal, *Voeks RV494*; Rambai, Sg Medit, *Simpson 2631*; Benutan Lake, *Edwards 2223*.

Distribution. Pantropical.

Ecology. Terrestrial on open or sparsely-shaded forest areas, sometimes epiphytic on trees or man-made structures; lowlands to 1000 m a.s.l. Threat: Least Concern.

Nephrolepis davallioides (Sw.) Kunze, Bot. Zeitung (Berlin) 4: 460. 1846.

TEM: Amo, Bkt Retak, *Johns RJ6749*, *Johns RJ6737*, *Wong WKM840*.

Distribution. Thailand, and throughout Malesia.

Ecology. Epiphytic on tree trunks from 300–1000 m a.s.l. Threat: Least Concern.

Nephrolepis falciformis J.Sm., Ferns Brit. For. 287. 1866.

(-) *Nephrolepis falcata* (Cav.) C.Chr., Dansk Bot. Ark. 9(3): 15. t. 1(5-9). 1937.

TEM: Amo, Bkt Belalong, *Johns RJ6990*; Amo, Sg Temburong, *Johns RJ7407*; Amo, Bkt Retak, *Wong WKM s.n.*, *Idris et al. BRUN15879*; Amo, Batu Apoi FR, Sg Temburong-Machang, *Wong WKM1927*, *Edwards 629*; Amo, Bkt Belalong, *Johns RJ7020*; Sg Sitam, *Edwards 987*; Sg Enkiang, FSC, *Edwards 2096*; Amo, Batu Apoi FR (K Belalong FSC), *Edwards 987*; Amo, K Belalong, *Ashton A33*, *Ashton A49*; Amo, Batu Apoi FR (K Belalong FSC), *Edwards 2096*.

Distribution. Sri Lanka, China, Indochina, and throughout Malesia.

Ecology. Epiphytic on tree trunks in forests, between 600–800 m a.s.l. Threat: Least Concern.

Nephrolepis hirsutula (G.Forst.) C.Presl, Tent. Pterid. 79. 1836.

TUT: Rambai, Tasek Merimbun, *Bernstein JHB223*.

Distribution. Indochina, throughout Malesia, to the Pacific Islands and Australia; widely naturalised in the New World tropics.

Ecology. Mainly a lowland species in open areas and sparse forests. Threat: Rare in Brunei.

Nephrolepis radicans (Burm.) Kuhn, Ann. Mus. Bot. Lugduno-Batavi 4. 285. 1869.

TEM: Batu Apoi, Kpg Selapon, *Wong WKM2073*; Batu Apoi, Sg Batu Apoi, *Edwards 629*.

Distribution. India, China, Indochina and throughout Malesia to New Caledonia.

Ecology. Common in scrubby vegetation and disturbed areas. Threat: Least Concern.

Family 23. OLEANDRACEAE

23.1. Oleandra Cav., Anales Hist. Nat. 1: 115. 1799.

Oleandra coriacea Copel., J. Straits Branch Roy. Asiat. Soc. 63: 72. 1912.

TEM: Amo, G Pagon, *Edwards 724*; Amo, G Pagon Periok, *Ashton A424*.

Distribution. Endemic to Borneo (Brunei, Kalimantan, Sarawak).

Ecology. Amongst summit vegetation in montane areas between 1100–2200 m a.s.l. Threat: Rare in Brunei.

Oleandra musifolia (Blume) C.Presl. Abh. Königl. Böhm. Ges. Wiss., ser. 5, 6: 402. 1851.

BEL: Melilas, Bkt Batu Patam (Ulu Ingei), *Wong WKM1122*.

Distribution. Sri Lanka, India, Indochina, Brunei, Indonesia (Java, Lesser Sunda Islands, Sulawesi), Philippines, Australia.

Ecology. Lithophytic; a montane species often found in disturbed forests; c. 2000 m a.s.l. Threat: Rare in Brunei.

Oleandra neriiformis Cav., Anales Hist. Nat. 1: 115. 1799. (Fig. 37).

TEM: Amo, Batu Apoi FR, *Joffre et al. BRUN20032*; Amo, G Pagon, *Coode MC7548*; Amo, Batu Apoi FR, *Wong WKM s.n.*; Amo, G Pagon Periok, *Ashton A242*; Batu Apoi, Bkt Gelagas (Bkt Suang), *Simpson 2306*; Labu, Peradayan FR, *Ariffin et al. BRUN19910*; Labu, Bkt Patoi (Peradayan FR), *Dransfield SD976*; Labu, Bkt Patoi (Peradayan FR), *Edwards 875*. Amo, Batu Apoi FR, *Wong WKM s.n.*; Amo, Bkt Tudal, *Davis APD464*; Amo, Bkt Retak, *Johns RJ6545*; Amo, Bkt Retak, *Wong WKM740*; Amo, Bkt Belalong, *Wong WKM1444*; Amo, Bkt Retak, *Edwards 818*; Amo, Sg Temburong, *Johns RJ7384*; Amo, Sg Temburong, *Hussain s.n.*; Amo, Sg Temburong, *Johns RJ7369*; Amo, Sg Temburong, *Wong WKM459*; Amo, Sg Temburong, *Coode MC6498*; Bkt Pagon, *Liaw 25*; Amo, Bkt Belalong, *Edwards 2308*; Bkt Patoi, *Dransfield SD976*.

Distribution. India, China, Indochina, throughout Malesia to the Pacific Islands.

Ecology. Lowlands to montane sites, in dry and sparse forest, sometimes on rocky substrate. Threat: Least Concern.

Family 24. OPHIOGLOSSACEAE

24.1. Helminthostachys Kaulf., Flora 5: 103. 1822.

Helminthostachys zeylanica (L.) Hook., Gen. Fil. [Hooker] t. 47. 1840. (Fig. 38).

BEL: Labi, Kpg Tenajor, *Haslani HA5*; Labi, Kpg Teraja, *Sands MS5685*; Pipeline, *Edwards 959*; Sg Teraja, *Edwards 2539*; Wasai

Figure 37. Oleandraceae. *Oleandra neriiformis* (Photo D. Cicuzza).

Figure 38. Ophioglossacea. *Helminthostachys zeylanica* (Photo D. Cicuzza).

Beluluk, *Low LYW504*. **TEM**: Amo, Sg Temburong, *Edwards 632*; Amo, Sg Temburong, *Johns RJ7327*; Batu Apoi, Kpg Selapon, *Dransfield JD7486*. **TUT**: Rambai, Tasek Merimbun; *Bernstein JHB403*; Rambai, Sg Tutong, *Simpson 2605*; Ukong, Kpg Ukong, *Johns RJ7082*.

Distribution. India, Sri Lanka, China, Japan, Indochina, throughout Malesia, to New Caledonia, Australia and Micronesia.

Ecology. Lowlands to montane forests. In secondary forests, plantations, and sparse forests. Widely consumed as a vegetable in most of its distributional range. Threat: Rare in Brunei, or perhaps over-collected. This is a common edible species in Brunei; all individuals available in the market are collected (over-collected?) from the wild. Further studies are needed to understand the population size of this species.

24.2. Ophioglossum L., Sp. Pl.: 1062. 1753.

Ophioglossum intermedium Hook., Icon. Pl. 10: t. 995. 1854.

BEL: Labi, Wasai Wong Kadir, *Coode MC7209*; Melilas, Sg Ingei, *Kessler PK417*. **TEM**: Amo, Sg Temburong, *Edwards 638*. **TUT**: Lamunin, Kpg Lamunin, *Edwards 964*.

Distribution. Indonesia (Sumatra, Java), Brunei, Malaysia (Sabah), Philippines, Papua New Guinea and Australia.

Ecology. In forest margins, secondary forest, and disturbed forest. Threat: Least Concern.

Ophioglossum nudicaule L.f., Suppl. Pl. 443. 1782.

BRM: UBD campus, *Edwards 2325*.

Distribution. Pantropical.

Ecology. In disturbed areas and meadows. Threat: Least Concern.

Ophioglossum pendulum L., Sp. Pl. (ed. 2) 2: 1518. 1763.

BEL: Labi, Sg Rampayoh, *Coode MC7283*.

Distribution. Old World tropics and subtropics, Madagascar, Sri Lanka, India, China, Korea, Japan, Indochina, throughout Malesia, Australia and the Pacific Islands.

Ecology. From lowlands to montane forests; epiphytic, occasionally terrestrial. Threat: Least Concern.

Ophioglossum reticulatum L., Sp. Pl. 2: 1063. 1753.

BRM: Gadong, Kpg Gadong, *Edwards 2325*.

Distribution. Pantropical in tropical and subtropical regions.

Ecology. Lowlands to montane areas. In forests, secondary forests, and urban areas. Threat: Least Concern.

Family 25. PLAGIOGYRIACEAE

25.1. Plagiogyria (Kunze) Mett., Abh, Seckenberg. Naturf. Ges. 2: 265. 1858.

Plagiogyria egenolfioides (Baker) Copel., J. Straits Branch Roy. Asiat. Soc. 63: 72. 1912.

TEM: Amo, G Pagon, *Coode MC7544*; Amo, G Pagon, *Wong WKM1763*; Amo, Bkt Retak, *Edwards 846*; Amo, G Pagon, *Ariffin ARK136*.

Distribution. Malaysia (Malay Peninsula, Sarawak, Sabah), Brunei, Indonesia (Sumatra, Kalimantan, Sulawesi, Maluku, Indonesian New Guinea), Philippines, Papua New Guinea, Solomon Islands.

Ecology. In mossy forests and on shaded sandstone cliffs between 1200–4000 m a.s.l. Threat: Least Concern.

Family 26. POLYPODIACEAE

26.1. Acrosorus Copel., Philipp. J. Sci. 1(Suppl. 2): 158. 1906.

Acrosorus pectinatus Parris, **sp. nov.**

Type: Brunei, Mt Galagas [= Gelagas], 350–500 m a.s.l., 24 Oct. 1991, *Simpson & Marsh s.n.* (holotype K!). Paratype: Sabah: Imbak Canyon, Mt Kuli, c. 600 m, Nov. 2010, *Ezzawanis & Yao FRI* 63983 (KEP images seen).

Diagnosis

Differs from all other species in the genus by the following combination of characters: rhizomes radial, stipes in whorls and longest fertile pinnae c. 0.5 mm wide.

Description

Stipes 2–3 × c. 0.2 mm, dull dark brown; glabrous. Laminae 72–85+ × 5–6 mm, linear, apex bluntly acute, base long-attenuate, deeply pinnately divided to wing 0.1–0.2 mm wide along rachis, pinnae 38–45 pairs, lowest 2–3 pairs reduced to auricles, longest pinnae 3–4 × c. 0.5 mm, narrowly oblong, apex bluntly acute to acute, base adnate to slightly decurrent on acroscopic margin, decurrent on basiscopic margin, entire, acroscopic and/or basiscopic margins folded over sori; texture thinly coriaceous; with ± appressed 1-forked hairs c. 0.1 mm with translucent or pale to medium red-brown base, a dark red-brown seta as branch and glandular apex occasional to sparse on abaxial surface of rachis and sometimes occasional on abaxial surface of lamina on pinna vein adjacent to rachis, and ± appressed translucent to pale red-brown simple catenate hairs c. 0.1 mm with pale to medium red-brown cross-walls occasional on abaxial surface of lamina and abaxial surface of rachis and occasional to sparse on margin, sometimes occasional on adaxial surface of lamina and adaxial surface of rachis; rachis slightly prominent and concolorous with lamina to slightly darker than it on abaxial surface, sunken and concolorous with lamina to darker than it on adaxial surface; veins unbranched, without hydathodes. Sori narrowly elliptic, slightly sunken in shallow depressions in lamina and protected by folded acroscopic and/or basiscopic margin, opening at right angles to abaxial surface of lamina.

Etymology

Latin, *pectinatus* = comb-like, referring to the narrow parallel pinnae.

Distribution

Brunei, Malaysia (Sabah). **TEM:** Bkt Gelagas, *Simpson & Marsh s.n.*

Ecology

On mossy rocks near rivers (350–500 m a.s.l.). Threat: Rare in Brunei; known from two collections, one in Brunei and one in Sabah.

Acrosorus streptophyllus (Baker) Copel., Philipp. J. Sci. 56(4): 480. 1935. (Fig. 39).

TEM: Bkt Biang, *Ashton A179*; Bkt Retak**,** *Johns RJ6575*, *Wong WKM733*, *Edwards 835*; G Pagon, *Coode MC7495*, *Wong WKM1799*; Ulu Temburong, *Wong WKM3317*.

Distribution. Brunei, Malaysia (Malay Peninsula, Sarawak, Sabah), Indonesia (Kalimantan).

Ecology. Epiphyte on mossy tree trunks and mossy tree branches in montane mossy forest and upland mixed dipterocarp forest in transition to lower montane forest (370–150 m a.s.l.). Threat: Least Concern.

26.2. Calymmodon C.Presl., Tent. Pterid.: 203. 1836.

Calymmodon ashtonii Parris, **sp. nov.**

Type: Brunei, Bkt Patoi, 960 ft, 9 April 1957, *Ashton 132* (holotype K!, plant in centre of sheet, middle of second vertical row; isotypes K! all other plants on sheet). Paratype: Brunei: Temburong: Bkt Patoi, on rock face amongst moss and orchids, just below mixed dipterocarp forest, 10 Oct. 1987, *Edwards 880* (*BRUN 016255* image seen).

Diagnosis

Calymmodon ashtonii Parris, resembles *C. clavifer* (Hook.) T.Moore in membranous to chartaceous laminar texture, lamina

Figure 39. Polypodiaceae. *Acrosorus streptophyllus* (Photo KM. Wong).

pinnate or deeply pinnately divided to wing c. 0.1 mm wide along rachis, setae present on the abaxial surface of the rachis and the longest fertile pinnae with a distinct stalk at least 1 mm long, but differs in the absence of branched hairs and in having setae only on the abaxial surface of the rachis and on the lamina margin, rather than being more widely distributed.

Description

Stipes ± winged to base. Laminae (37–)38–50(–53) × 8–11(–12) mm, narrowly lanceolate to narrowly elliptic, apex bluntly acute to obtuse, base long-attenuate, deeply pinnately divided to wing c. 0.1 mm wide along rachis, pinnae 9–12 pairs, longest fertile pinnae (3.0–)4.0–5.5 x (1.2–)1.3–1.6(–1.7) mm, × 0.6–0.9 mm folded, on stalk c. 2 mm long, spathulate when unfolded, narrowly semicircular when folded, apex obtuse, base slightly surcurrent on acroscopic margin, decurrent on basiscopic margin, lowest fertile pinnae shorter than uppermost sterile pinnae, longest sterile pinnae (4.2–)4.9–7.1(–7.2) × (0.8–)0.9–1.2(–1.3) mm, linear-oblanceolate, apex bluntly acute to acuminate, base slightly surcurrent on acroscopic margin, decurrent on basiscopic margin, entire; texture chartaceous; with ± patent pale yellow-brown setae sparse to scattered on abaxial surface of rachis (0.6–0.9 mm) and occasional on margin (0.3–0.4 mm); veins ending in a dark elongate hydathode 0.2–0.3 × c. 0.1 mm on adaxial surface of lamina.

Etymology

Named in honour of Peter Ashton, an English botanist (fl. 1957) who worked in Brunei and Sarawak.

Distribution

Brunei. **TEM:** Bkt Patoi, *Ashton A132*, *Edwards 880*.

Ecology

On tertiary sandstone rocks in primary kerangas forest and mixed dipterocarp forest (c. 290 m a.s.l.). Threat: Rare in Brunei; known only from the type locality.

Calymmodon gracilis (Fée) Copel., Philipp. J. Sci. 34(3): 266. 1927.

TEM: Bkt Gelagas, *Simpson 2308*; G Pagon, *Wong WKM1772*; Bkt Retak**,** *Johns RJ6633*, *Johns RJ6634*, *Wong WKM868*, *Wong WKM869*; Bkt Belalong, *De Vogel 9019*, *De Vogel 9030.*

Distribution. Taiwan, Vietnam, Indonesia (Sumatra, Kalimantan, Sulawesi, Maluku, Indonesian New Guinea), Brunei, Malaysia (Malay Peninsula, Sarawak, Sabah), Philippines, Papua New Guinea and Solomon Islands.

Ecology. Epiphyte on mossy tree trunks in hill dipterocarp forest and lower montane forest (620–1480 m a.sl.). Threat: Least Concern.

Calymmodon minutus Parris, **sp. nov.**

Type: Brunei, Temburong, Amo, G Pagon, around helipad, 418'N 115°20'E, 1480 m, 1 April 1993, *Coode 7598*, *Ferguson, Niga, Ariffin, Awon, Jangarun, Ramlee & Melinau* (holotype K!).

Diagnosis

Calymmodon minutus Parris, resembles *C. gracilis* (Fée) Copel. and *C. persimilis* Tagawa in fronds having marginal setae and setae on the adaxial surface of the fertile veins, but differs from them in having all or most of the setae on the adaxial surface of the fertile veins c. 0.1 mm long, rather than more than 0.4 mm long.

Description

Stipes ± winged to base. Laminae 18–24(–25) × 3–4 mm, narrowly oblanceolate, obtuse to bluntly acute at apex, long-attenuate at base, pinnate or deeply pinnately divided to wing c. 0.1 mm wide along rachis, pinnae 7–10 pairs, lowest pair sometimes reduced to auricles, longest fertile pinnae (2.0–)2.2–2.8 × 0.6–0.9(–1.1) mm folded, × c. 1.5 mm unfolded, not stalked, ± semicircular when folded, obovate when unfolded, apex obtuse, base slightly surcurrent on acroscopic margin, decurrent on basiscopic margin, lowest fertile pinnae slightly longer than to slightly shorter than uppermost sterile pinnae, longest sterile pinnae 2.0–2.7(–3.0) × (1.0–)1.1–1.4 mm, narrowly obovate to broadly oblanceolate, apex obtuse, base slightly surcurrent on acroscopic margin, decurrent on basiscopic margin, entire; texture chartaceous to thinly coriaceous; with ± patent whitish to pale red-brown setae c. 0.1 mm sparse to scattered on abaxial surface of rachis, occasional to scattered on margin particularly near pinna apex, occasional on

adaxial surface of lamina and occasional to scattered on adaxial surface of vein particularly above receptacle, and ± appressed pale red-brown 1–3-forked hairs c. 0.1 mm with catenate base, setae as branches and glandular apex occasional to sparse on abaxial surface of rachis and occasional on adaxial surface of vein; veins ending in a dark ± elongate hydathode c. 0.2 × 0.1 mm on adaxial surface of lamina.

Etymology

Latin, *minutus* = very small, referring to the size of the plants relative to other species in the genus.

Distribution

Brunei. **TEM**: G Pagon, *Coode MC7598*.

Ecology

c. 1480 m a.s.l. Threat: Rare in Brunei; known only from the type collection.

Calymmodon pectinatus Parris, Fern Gaz. 21(6): 254. 2021.

TEM: Bkt Retak, *Johns RJ6578*.

Distribution. Indonesia (Sumatra, Java, Maluku, Indonesian New Guinea), Brunei, Malaysia (Sabah, Sarawak), Philippines, Papua New Guinea.

Ecology. Epiphyte in montane forest (1300–1350 m a.s.l.). Threat: Rare in Brunei.

Calymmodon rupicola Parris, **sp. nov.**

Type: Brunei, Belait District, Ulu Ingei, Bkt Batu Patam, 4°5'N 114°42'E, 200 m, 9 June 1989, *S Dransfield 947, KM Wong, J Dransfield & PC Boyce* (holotype K!; isotype BRUN 016047 images seen). Paratype: Brunei: Belait: Ulu Ingei, Bkt Batu Patam, 4°5'N 114°42'E, mixed dipterocarp forest, Belait series sandstone, 13 June 1989, 90 m a.s.l., *S Dransfield 969* et al. (K, BRUN 016046 image seen).

Diagnosis

Calymmodon rupicola Parris, differs from the few other species of *Calymmodon* that lack hydathodes by the following combination of characters: rachis wing c. 0.1 mm wide; membranous to chartaceous laminar texture; setae absent, branched hairs, if present, with dark red-brown setae as branches; lithophyte on sandstone rocks.

Description

Stipes ± winged to base or 1–2 × c. 0.2 mm, dull dark brown to black; glabrous or with occasional ± appressed 1-forked hairs c. 0.1 mm with translucent catenate base, a dark red-brown seta as branch and pale to medium red-brown glandular apex. Laminae (30–)40–64(–87+) × 3–4 mm, linear, apex bluntly acute to obtuse, base long-attenuate, pinnate or deeply pinnately divided to wing c. 0.1 mm wide along rachis, pinnae (18–)24–33(–37+) pairs, lowest 1–2(–3) pairs usually reduced to auricles, longest fertile pinnae (1.2–)1.5–2.3 × (0.7–)0.8–1.2 mm unfolded, × 0.4–0.6(–0.7) mm folded, apex obtuse, base adnate on acroscopic margin, decurrent on basiscopic margin, obovate when unfolded, oblong to ± hemispherical when folded, not stalked, basiscopic and/or acroscopic margin partly folded over sori, lowest fertile pinnae slightly shorter than uppermost sterile pinnae, longest sterile pinnae (1.7–)1.8–2.2(–2.5) × (0.6–)0.8–1.0 mm, oblong, oblanceolate or narrowly obovate, apex obtuse to bluntly acute, base adnate on acroscopic margin, decurrent on basiscopic margin, entire; texture membranous to chartaceous; glabrous or with ± appressed 1-(2-)forked hairs 0.1–0.2 mm with translucent catenate base, dark red-brown setae as branches and medium red-brown glandular apex occasional to scattered on abaxial surface of rachis, sometimes occasional to sparse on abaxial surface of lamina especially on veins, occasional on margin, adaxial surface of lamina especially on veins and adaxial surface of rachis near base of lamina, sometimes with ± appressed translucent or pale to medium red-brown simple catenate hairs c. 0.1 mm with medium to dark red-brown gland occasional to scattered on abaxial surface of lamina adjacent to rachis, occasional on abaxial surface of rachis, margin and adaxial surface of lamina adjacent to rachis, and occasional to sparse on adaxial surface of rachis; veins without hydathodes

Etymology

Latin, *rupicola* = growing on rocks, referring to the habitat, unusual in the genus.

Distribution

Brunei, Malaysia (Sabah). **BEL**: Bkt Batu Patam, *Dransfield SD947, Dransfield SD969*.

Ecology

On mossy rocks in mixed dipterocarp forest and ridge-top kerangas forest transitional to mixed dipterocarp forest (90–200 m a.s.l.). Threat: Rare in Brunei, known only from the type locality.

26.3. Ctenopterella Parris, Gard. Bull. Singapore 58: 234. 2007.

Ctenopterella blechnoides (Grev.) Parris, Gard. Bull. Singapore 58(2): 235. 2007.

TEM: K Belalong, *Ashton A364*; G Pagon, *Liaw 22*.

Distribution. India, Sri Lanka, China, Indochina, Singapore, Indonesia (Sumatra, Lesser Sunda Islands, Kalimantan, Sulawesi, Maluku, Indonesian New Guinea), Brunei, Malaysia (Malay Peninsula, Sarawak, Sabah), Philippines, Papua New Guinea, Australia, the Solomon Islands to Society Islands, Micronesia.

Ecology. Epiphyte along rivers and in submontane heath forest (60–890 m a.s.l.). Threat: Rare in Brunei.

Ctenopterella rivularis Parris, **sp. nov.**

Type: Brunei, Temburong River valley, along stream to E of helicopter pad, c. 30–50 m, 27 April 1992, *R J Johns 7362, Niga, Salleh, Shanang, Ham & Ramlee* (holotype K!; isotypes BRUN, K!). Paratype. Brunei: Temburong: Temburong River at Wong Nuang rap-

ids, 4°3'N 115°15'E, mixed lowland forest, shales, 120 m, 9 April 1990, *Coode 6679 et al.* (BRUN 016285 image seen).

Diagnosis

Ctenopterella rivularis Parris, differs from all other species in the genus by the following combination of characters: rhizome scales concolorous; vein endings with hydathodes; branched hairs with setae as branches present on fronds, but setae absent.

Description

Rhizome scales narrowly lanceolate to linear-lanceolate, pale to medium red-brown, glabrous, concolorous. Stipes 2–3 × c. 0.3 mm, dull black; with scattered ± appressed pale red-brown 1-forked hairs c. 0.1 mm with catenate base, a seta as branch and glandular apex. Laminae 81–118(–120+) × 10–22(–33) mm, narrowly elliptic, apex long-caudate and bluntly acute, base narrowly cuneate, pinnate, pinnae c. 31 pairs, lowest 1–2(–3) pairs reduced to auricles, longest pinnae 5–11(–13) × 1–2 mm, narrowly oblong to linear, apex obtuse to bluntly acute, base adnate to slightly surcurrent on acroscopic margin, decurrent on basiscopic margin, entire; texture chartaceous; with ± appressed pale to medium red-brown 1–4-forked hairs 0.1–0.2 mm with catenate base, setae as branches and glandular apex occasional on abaxial surface of lamina and abaxial surface of costa, scattered on abaxial surface of rachis, occasional to sparse on margin, occasional on adaxial surface of lamina and adaxial surface of costa and occasional to sparse on adaxial surface of rachis; vein endings with a moderately dark ± circular hydathode c. 0.1 mm diam. on adaxial surface of lamina. Sori circular to broadly elliptic, superficial or slightly sunken in broad shallow depressions on abaxial surface of lamina, in 2 rows per pinna, 1 each side of costa, 2–4(–5) in each row on longest pinnae.

Etymology

Latin, *rivularis* = of streams, referring to the stream-side habitat.

Distribution

Brunei. **TEM:** Temburong River, *Coode MC6679, Johns RJ7392*.

Ecology

In lowland dipterocarp forests and mixed lowland forests, along rivers (30–120 m a.s.l.). Threat: Rare in Brunei; known only from the type locality.

26.4. Dasygrammitis Parris, Gard. Bull. Singapore 58: 238. 2007.

Dasygrammitis brevivenosa (Alderw.) Parris, Gard. Bull. Singapore 58(2): 239. 2007.

TEM: Bkt Pagon, *Edwards & Cantley 730*, *Booth P14*; Amo, Bkt Retak, *Edwards 862*.

Distribution. Brunei, Malaysia (Malay Peninsula, Sarawak, Sabah), Indonesia (Sulawesi), Solomon Islands.

Ecology. Epiphyte in mossy montane forests (1520–1610 m a.s.l.). Threat: Rare in Brunei.

26.5. Drynaria (Bory) J.Sm., J. Bot (Hooker) 4: 60. 1841, *nom. cons.*

Drynaria quercifolia (L.) J.Sm., J. Bot. (Hooker) 3: 398. 1841. (Fig. 40).

BEL: Labi, Bkt Teraja, *Johns RJ6900*. **BRM**: Jln Kota Batu, *Edwards 453*; Pulau, Muara, *Grindrod JG/BR16*. **TEM**: Amo, Ulu Belalong LP382, *Kirkup DK863*. **TUT**: Rambai, Sg Tutong, *Simpson 2608*; Telisai, Pasir Puteh, *Johns RJ6506*; Kpg Bakok, *Cicuzza 2707*.

Distribution. Sri Lanka, India, Nepal, Bhutan, Bangladesh, Indochina, throughout Malesia to Australia.

Ecology. Epiphytic, spirally climbing; in forests, sparse forests, and plantations from the lowlands to 1200(–1900) m a.s.l. Threat: Least Concern.

Drynaria sparsisora (Desv.) T.Moore, Index Fil. (T. Moore) 348. 1862.

BEL: Labi Hills, *Edwards 792*. **TEM**: Amo, Batu Apoi FR, *Sands MS5804*; Batu Apoi, Bkt Gelagas (Bkt Suang), *Simpson 2269*; Amo, Sg Temburong, *Wong WKM458*; Amo, K Belalong, *Dransfield SD1024*, *Dransfield SD1033*; Batu Apoi, Sg Selapon, *Wong*

Figure 40. Polypodiaceae. *Drynaria quercifolia* (Photo D. Cicuzza).

WKM2090; Amo, Batu Apoi FR (K Belalong FSC), *Poulsen ADP81*, *Middleton DJM793*; Amo, Bkt Belalong, *Sands MS5541*; Amo, Sg Sibut, *Johns RJ6905*; Amo, Bkt Lutut LP297, *Ariffin et al. BRUN20820*; Amo, Sg Temburong, *Johns RJ7194*; Bkt Patoi, *Edwards 878*; Sg Belalong FSC, *Edwards 2085*; Sg Dolhakim, *Edwards 572*; Amo, Belalong, FSC, *Cicuzza 2603*. **TUT**: Rambai, Ulu Tutong, *Johns RJ7479*, *Johns RJ7523*; Telisai, Pasir Puteh, *Johns RJ6772*.

Distribution. Sri Lanka, Indochina, throughout Malesia to the Solomon Islands and Australia.

Ecology. Epiphytic, spirally climbing; in primary and secondary forests from near sea level to 1400(–1900) m a.s.l. Threat: Least Concern.

Drynaria speciosa (Blume) Christenh., Phytotaxa 230: 299. 2015.

TEM: Bkt Patoi, *Edwards 2408*; Sg Dolhakim, *Edwards 563*; Belalong, FSC, *Edwards 2290*.

Distribution. Indochina, Malaysia (Malay Peninsula, Sarawak, Sabah), Brunei, Indonesia (Sumatra, Java, Kalimantan, Sulawesi), Philippines.

Ecology. In mature forests. Threat: Least Concern.

26.6. Glabrigrammitis Li Bing Zhang, X.M.Zhou, Jian Jun Yang & Parris, Phytotaxa 597: 34. 2023.

Glabrigrammitis vittariifolia (C.Chr.) Parris, Fern Gaz. 22(3): 145. 2024.

BEL: Bkt Teraja, *Hotta MH12824.*

Distribution. Brunei, Malaysia (Malay Peninsula, Sarawak, Sabah).

Ecology. 300–430 m a.s.l. Threat: Rare in Brunei.

26.7. Goniophlebium (Blume) C.Presl, Tent. Pterid.: 185. 1836.

Goniophlebium percussum (Cav.) W.H.Wagner & Grether, Occ. Pap. Bernice Pauahi Bishop Mus. 19: 88. 1948.

BEL: Wasai Wong Kadir, *Edwards 2564*; Sg Ayam Ayam, *Edwards 677*. **TEM**: Amo, Sg Temburong, *Johns RJ7260*; Amo, Bkt Belalong, *Wong WKM1474*; Batu Apoi, Sg Temburong-Machang, *Wong WKM1976*; Bato Api, Sg Motong, *Samhan SN8(B)*; Sg Belalong, FSC, *Edwards 2199*; Bkt Patoi, *Edwards 2264*. **TUT**: Lamunin, Ladan Hills FR, *Ariffin et al. BRUN17589*; Lamunin, Kpg Lamunin, *Edwards 958*; Rambai, Sg Medit, *Simpson 2614*; Ukong, Kpg Rampau, *Edwards 656*; Sg Padang, Merimbun, *Edwards 665*; Tasek Merumbun, *Edwards 595*; Benutan Lake, *Edwards 2218*.

Distribution. Thailand, throughout Malesia, to Australia.

Ecology. Epiphytic species in forests; also in sparse, disturbed sites; near sea level to 1100(–1600) m a.s.l. Threat: Least Concern.

Goniophlebium persicifolium (Desv.) Bedd., Suppl. Ferns Brit. Ind. 21: pl. 79. 1876.

TEM: Amo, Sg Temburong, *Johns RJ7233*; Amo, Bkt Retak, *Johns RJ6712*.

Distribution. India, China, throught Malesia, to the Pacific Islands.

Ecology. A forest species, usually epiphytic (rarely terrestrial); between 150–1900 m a.s.l. Threat: Least Concern.

26.8. Lecanopteris Reinw., Flora 8(2, Beibl.): 48. 1825.

Lecanopteris crustacea Copel., Univ. Calif. Publ. Bot. 12: 406. 1931. (Fig. 41).

BEL: Bkt Sawat, Jln Labi (Merangking junction), *Wong WKM1616*; Liang, Andulau FR (Sg Liang), *Wong WKM184*; Melilas, Sg Ingei, *Wong WKM s.n.* **TEM**: Amo, Kpg Batang Duri, *Edwards 884*; Labu, Bkt Patoi (Peradayan FR), *Dransfield SD971*; Amo, Belalong, KBFSC, *Cicuzza 2720*.

Distribution. Malaysia (Malay Peninsula, Sarawak, Sabah), Brunei, Indonesia (Sumatra, Kalimantan).

Figure 41. Polypodiaceae. *Lecanopteris crustacea* (Photo D. Cicuzza).

Ecology. Epiphyte in lowland evergreen heath and freshwater swamp forest; often found at very low densities. Threat: Rare in Brunei.

Lecanopteris pumila Blume, Fl. Javae Fil.: t. 94 B. 1829. (Fig. 42).

TEM: Amo, G Pagon, *Ariffin ARK137*, *Booth P21*; Amo, G Pagon ridge, *Wong WKM1909*; Amo, G Pagon Periok, *Ashton A416*.

Distribution. Malaysia (Malay Peninsula, Sarawak, Sabah), Indonesia (Sumatra, Kalimantan).

Ecology. Epiphyte in mid-montane forest. Threat: Rare in Brunei.

Lecanopteris sinuosa (Wall. ex Hook.) Copel., Univ. Calif. Publ. Bot. 16: 123. 1929. (Fig. 43).

BEL: Bkt Sawat, Jln Labi (km 13), *Chin CSC4551*, *Gay s.n.*; Seria, Badas SL, *Gay 1200*, *Niga NN30*; K Belait, Sg Belait, *Dransfield SD1122*; Liang, Andulau FR (Sg Liang), *Niga et al. BRUN15443*; Seria, Anduki, *Idris et al. BRUN15865*; Seria, Badas FR. **BRM**: UBD Campus, *Kian 14*; Berakas coastal forest, *Edwards 456*; Beribi Gadong, *Azlan et al. BRUN23092*. **TEM**: Amo, Batu Apoi FR (K Belalong FSC), *Poulsen ADP197*; Sg Dolhakim, *Edwards 656*.

Distribution. Taiwan, Indochina, throughout Malesia to the Pacific Islands, and Australia.

Ecology. Epiphyte in lowland forests, from evergreen to seasonal and disturbed forests below 500 m a.s.l. Threat: Least Concern.

26.9. Lepisorus (J.Sm.) Ching, Bull. Fan. Mem. Inst. Biol. 4: 56. 1933.

Lepisorus accedens (Blume) Hosok., Trans. Nat. Hist. Soc. Formosa 31: 477. 1941.

TEM: Amo, Sg Temburong, *Johns RJ7160*; Amo, Batu Apoi FR (K Belalong FSC), *Edwards 2078*, *Edwards 2459*, *Edwards 2008*; Amo, Sg Belalong (Amo), *Wong WKM1322*, *Wong WKM1159*; Batu Apoi, Bkt Gelagas (Bkt Suang), *Simpson 2341*, *Simpson 2440*.

Distribution. Thailand, throughout Malesia, to the Pacific Islands, and Australia.

Figure 42. Polypodiaceae. *Lecanopteris pumila* (Photo KM. Wong).

Figure 43. Polypodiaceae. *Lecanopteris sinuosa* (Photo D. Cicuzza).

Ecology. Epiphyte in mature mixed dipterocarp forest. Threat: Least Concern.

Lepisorus annamensis (C.Chr.) Li Wang, Bot. J. Linn. Soc. 162: 35. 2010.

TEM: Amo, Sg Temburong, *Johns RJ7340*.

Distribution. China, Indochina, Indonesia (Kalimantan), Brunei, Malaysia (Sarawak).

Ecology. Epiphytic or lithophytic in evergreen forests; lowlands to 1900 m a.s.l. Threat: Rare in Brunei.

Lepisorus longifolius (Blume) Holttum, Rev. Fl. Malaya 2: 151. 1955.

BEL: Labi, Bkt Teraja, *Johns RJ6898*; Labi, Bkt Teraja, *Johns RJ6891*; Peatswamp Badas, *Dransfield SD1127*. **TEM**: Amo, Sg Temburong, *Idris et al. BRUN15300*; Amo, Batu Apoi FR (K Belalong FSC), *Edwards 2073, Samhan SN91/1*; Amo, Bkt Belalong, *De Vogel 9023*; Amo, Bkt Belalong, *De Vogel 9015*; Amo, Sg Belalong (Amo), *Wong WKM1323*; Amo, Sg Temburong, *Wong WKM1309*; Amo, Sg Temburong, *Wong WKM467*; Amo, K Belalong, *Dransfield SD1202*; Batu Apoi, Bkt Gelagas (Bkt Suang), *Simpson 2229*; Amo, Sg Temburong; *Coode MC6506*; Amo, Sg Temburong, *Johns RJ7201*; Amo, Sg Temburong; *Johns RJ7329*; Amo, Sg Temburong; *Johns RJ7175*; Amo, K Belalong; *Johns RJ7005*; Amo, K Belalong; *Johns RJ6984*; Sg Sitam, *Edwards 993*; Bato Apoi, *Ariffin et al. BRUN23427*; Amo, G Pagon, *Liaw 52*; Kpg Bakok, *Cicuzza 2710*.

Distribution. India, China (Hainan), Taiwan, Indochina, Malaysia (Malay Peninsula, Sarawak, Sabah), Brunei, and Indonesia (Sumatra, Java, Kalimantan, Sulawesi).

Ecology. Epiphytic, rarely terrestrial, in various types of forests; lowlands to 800(–1350) m a.s.l. Threat: Least Concern.

Lepisorus mucronatus (Fée) Li Wang, Bot. J. Linn. Soc. 162: 35. 2010.

TEM: Amo, K Belalong, *Ashton A61*; Amo, K Belalong, *Dransfield SD1027*; Amo, Sg Temburong, *Sands MS5338*; Batu Apoi, Bkt Gelagas (Bkt Suang), *Simpson 2407*; Batu Apoi, Sg Temburong-Machang, *Wong WKM1986*; Batu Apoi, Bkt Gelagas (Bkt Suang), *Simpson 2327*; Batu Apoi, Bkt Gelagas (Bkt Suang), *Simpson 2491*; Amo, Sg Belalong, *Cicuzza 2734*.

Distribution. Sri Lanka, Taiwan, Indochina, throughout Malesia to Australia, and the Pacific Islands.

Ecology. Epiphyte or lithophyte in primary and secondary forests; lowlands to 1500 m a.s.l. Threat: Least Concern.

Lepisorus spicatus (L.f.) Li Wang, Bot. J. Linn. Soc. 162: 35. 2010.

TEM: Amo, Bkt Retak, *Johns RJ6594*.

Distribution. Old World tropics.

Ecology. Epiphyte or lithophyte in primary and secondary forests; common in montane areas to 3000 m a.s.l. Threat: Rare in Brunei.

Lepisorus validinervis (Kunze) Li Wang, Bot. J. Linn. Soc. 162: 36. 2010.

TEM: Amo, Bkt Retak, *Wong WKM856*.

Distribution. Throughout Malesia, to New Caledonia.

Ecology. Epiphyte or lithophyte in primary and secondary montane forests between 1200–4000 m a.s.l. Threat: Rare in Brunei.

26.10. Leptochilus Kaulf., Enum. Filic.: 147. 1824.

Leptochilus macrophyllus (Blume) Noot., Blumea 42: 289. 1997.

(=) *Colysis acuminata* (Baker) Holttum, Rev. Fl. Malaya 2: 162, f. 73. 1955.

BEL: Labi, Labi Hills FR (Compt 12), *Ariffin et al. BRUN21320*; Labi, Sg Teraja, *Edwards 696*, *Ariffin et al. BRUN22560*; Pipeline, *Edwards 979*; Sg Teraja, *Edwards 781*. **BRM**: Pengkalan Batu, Kpg Wasan, *Edwards 979*. **TEM**: Batu Apoi, Selapon (Bkt Beliton), *Wong WKM2058*; Sg Temburong, *Edwards 2191*; Amo, Batu Apoi FR (K Belalong FSC), *Edwards 2019*, *Edwards 2456*, *Samhan SN19*; Amo, Sg Temburong, *Coode MC6653*; Amo, K Belalong, *Dransfield SD1021*; Amo, Sg Temburong, *Johns RJ7375*; Amo, Sg Temburong, *Johns RJ7141*; Amo, K Belalong, *Johns RJ7023*; Amo, Sg Temburong, *Johns RJ7155*; Amo, Batu Apoi FR, *Sands MS5817*, Amo, Belalong FSC, *Cicuzza 2641*. **TUT**: Lamunin, Ladan Hills FR, *Edwards 952*; Lamunin, Ladan Hills FR, *Ariffin et al. BRUN17579*; Merimbun Lake, MDF, *Cicuzza 2548*.

Distribution. China, Japan, Indochina, throughout Malesia, Solomon Islands.

Ecology. Terrestrial or lithophytic, sometimes epiphytic, along streams and at forest margins or forest sites with partially-open forest canopy; near sea level to 1800 m a.s.l. Threat: Least Concern.

Leptochilus pedunculatus (Hook. & Grev.) Fraser-Jenk., Taxon. Revis. Indian Subcontinental Pteridophytes: 62. 2008.

(=) *Gymnogramma membranacea* (Blume) Hook., Sp. Fil. 5: 159. 1864.

TUT: Pipeline road, *Edwards 981*.

Distribution. India, Bangladesh, China, Indochina, Malaysia (Malay Peninsula, Sarawak, Sabah), Brunei, Indonesia (Sumatra, Java), Philippines.

Ecology. Open sites and areas with stagnant water. Threat: Rare in Brunei.

26.11. Loxogramme (Blume) C.Presl, Tent. Pterid.: 214. 1836.

Loxogramme antrophyoides (Baker) C.Chr., Mitt. Inst. Hamburg 7. 163. 1928.

TEM: Amo, Kerangan Meritam, *Hussain et al. BRUN15674*; Amo, K Belalong, *Dransfield SD992*, *Johns RJ6994*, *RJ7011A*; Amo, Sg Belalong (Amo), *Wong WKM1324*; Amo, Batu Apoi FR (K Belalong FSC), *Edwards 998*, *Edwards 2183*.

Distribution. Malaysia (Sabah, Sarawak), Indonesia (Sumatra, Kalimantan, Sulawesi, Maluku), Brunei, Papua New Guinea.

Ecology. Epiphyte in mature tropical forests; lowlands to 1000 m a.s.l. Threat: Least Concern.

Loxogramme scolopendrioides (Gaudich.) C.V.Morton, Contr. U.S. Natl. Herb. 38: 242. 1973.

TEM: Amo, Bkt Retak, *Wong WKM847*; Amo, G Pagon, *Ariffin ARK140*.

Distribution. Indochina, throughout Malesia and the Pacific Islands.

Ecology. Epiphyte or lithophyte, sometimes found on limestone; usually found in lowland forests between 100–500 m a.s.l. Threat: Least Concern.

Loxogramme wallichiana (Hook.) M.G.Price, Amer. Fern J. 74(2): 61. 1984.

(=) *Loxogramme forbesii* Copel., Philipp. J. Sci., C 9: 232. 1914.

TEM: Amo, Bkt Retak, *Johns RJ6748*; Amo, Bkt Retak, *Johns RJ6718*; Amo, Sg Temburong, *Johns RJ7153*; Amo, Batu Apoi FR (K Belalong FSC), *Edwards 2010*, *Edwards 2454*, *Samhan SN91/2*; Amo, Sg Temburong, *Johns RJ7136*; Amo, Sg Belalong (Amo), *Edwards 2131*; Amo, Sg Belalong (Amo), *Edwards 2100*, *Edwards 2114*; Amo, Batu Apoi FR (K Belalong FSC), *Edwards 2182*; Batu Apoi, Bkt Gelagas (Bkt Suang), *Simpson 2388*; Batu Apoi, Bkt Gelagas (Bkt Suang), *Simpson 2393*; Sg Baki, *Edwards 2182*; Sg Sitam, *Edwards 2024*.

Distribution. Malaysia (Malay Peninsula, Sarawak, Sabah), Brunei, Indonesia (Sumatra, Kalimantan, Sulawesi).

Ecology. Epiphyte near rivers in lowland forests or humid areas in mature forest between 200–1500 m a.s.l. Threat: Least Concern.

26.12. Microsorum Link, Hort. Berol. 2: 110. 1833, *nom. cons.*

Microsorum congregatifolium (Alderw.) Holttum, Rev. Fl. Malaya 2: 178. 1954.

BEL: Labi, Kpg Rampayoh, *Ariffin et al. BRUN21735*.

Distribution. Malaysia (Malay Peninsula, Sarawak, Sabah), Indonesia (Sumatra, Kalimantan), Brunei, Philippines.

Ecology. Epiphytic, sometimes lithophytic, near streams or valleys, in densely shaded forests; between 30–1300 m a.s.l. Threat: Least Concern.

Microsorum heterocarpum Ching, Bull. Fan Mem. Inst. Biol. 4: 295. 1933.

BEL: Wasai Wong Kadir, *Cicuzza 2593*; Labi Hill, *Cicuzza 2694*. **TEM**: Amo, Bkt Retak, *Johns RJ6648*; Amo, Bkt Retak, *Johns RJ6707*; Amo, Bkt Retak, *Johns RJ6708*; Batu Apoi, Bkt Gelagas (Bkt Suang), *Simpson 2415*; Batu Apoi, Bkt Gelagas (Bkt Suang), *Simpson 2487*; Labu, Bkt Patoi (Peradayan FR), *Edwards 879*; Labu, Bkt Patoi (Peradayan FR), *Edwards 887*; Labu, Bkt Patoi (Peradayan FR), *Edwards 924*; Labu, Bkt Patoi (Peradayan FR), *Ashton A121*; Labu, Bkt Patoi (Peradayan FR), *Edwards 903*; Bkt Retak, *Johns RJ6684*; Amo, Sg Belalong, *Cicuzza 2741*.

Distribution. Malaysia, Indonesia (Sumatra, Java, Kalimantan, Sulawesi, and Maluku), Brunei, Philippines.

Ecology. Lithophyte, epiphyte, or terrestrial in primary forest, often on slopes in shady places between 50–2200 m a.s.l. Threat: Least Concern.

Microsorum membranifolium (R.Br.) Ching, Bull. Fan Mem. Inst. Bil. 10: 239. 1941. (Fig. 44).

(≡) *Phymatosorus membranifolius* (R.Br.) S.G.Lu, Guihaia 19: 27. 1999.

BEL: Melilas, Kpg Melilas, *Forman LLF1211*; Wasai Wong Kadir, *Edwards 2528*, *Edwards 2569*; Sg Teraja, *Edwards 685*; Telingan waterfall, *Ariffin et al. BRUN24483*. **TEM**: Sg Anak Babi, *Wong WKM3448*; Amo, K Belalong, *De Vogel 8944*, *Dransfield SD987*; Amo, Batu Apoi FR (K Belalong FSC), *Edwards 990*; Batu Apoi, Sg Selapon, *Wong WKM2041*; Amo, Batu Apoi FR, Sg Apan, *Ariffin et al. BRUN15752*; Amo, Sg Temburong, *Johns RJ6968*, *Johns RJ6978*, *Johns RJ7277*; Amo, Batu Apoi FR, *Niga et al. BRUN15051*; Amo, Bkt Belalong, *Sands MS5542*; Labu, Bkt Patoi (Peradayan FR), *Edwards 902*; Labu, Peradayan FR, *Ariffin et al. BRUN19899*; Sg Enkiang, *Edwards 2064*. **TUT**: Lamunin, Benutan dam, *Edwards 2245*, *Edwards 2339*.

Distribution. India, Sri Lanka to Indochina, China, throughout Malesia, the Pacific Islands.
Ecology. Terrestrial, epiphyte, or lithophyte, often on limestone and granite; to 1700 m a.s.l. Threat: Least Concern.

Microsorum musifolium (Blume) Copel., Univ. Calif. Publ. Bot. 16: 112. 1929.

TEM: Amo, Bkt Retak, *Johns RJ6719*, *Sands MS5373*; Amo, Sg Belalong (Amo), *Edwards 2115*; Batu Apoi, Sg Temburong-Machang, *Wong WKM1955*.

Distribution. Malaysia, Indonesia (Sumatra, Kalimantan, Indonesian New Guinea), Philippines.

Figure 44. Polypodiaceae. *Microsorum membranifolium* (Photo D. Cicuzza).

Ecology. Epiphyte on tree trunks in mature tropical forests between 200–1000 m a.s.l. Threat: Rare in Brunei.

Microsorum punctatum (L.) Copel., Univ. Calif. Publ. Bot. 16: 111. 1929.

BEL: Liang, Brunei Forestry Centre, *Ariffin et al. BRUN20436*. **BRM**: Jln Muara, *Edwards 550*.

Distribution. Old World tropics and subtropics.

Ecology. Epiphyte, lithophyte, or terrestrial in various types of forests, including sparse forest and secondary forest; near sea level to 2800 m a.s.l. Threat: Least Concern.

Microsorum sarawakense (Baker) Ching, Bull. Fan Mem. Inst. Biol. 4: 295. 1933.

TEM: Amo, Bkt Retak, *Wong WKM863*; Amo, Belalong, FSC, *Cicuzza 2578*.

Distribution. Malaysia (Malay Peninsula, Sarawak, Sabah) Indonesia (Sumatra, Java, Kalimantan), Brunei, Philippines.

Ecology. Terrestrial or epiphytic, in humid places between 500–1500 m a.s.l. Threat: Least Concern, but rare in Brunei.

Microsorum scolopendria (Burm.f.) Copel., Univ. Calif. Publ. Bot. 16: 112. 1929. (Fig. 45).

(≡) *Phymatosorus scolopendria* (Burm.f.) Pic.Serm., Webbia 28(2): 457, 460. 1973.

BEL: Seria, Badas FR, *Jangarun BRUN20217*. **BRM**: Serasa, Meragang Beach, *Idris et al. BRUN17361*; Jln Residency, *Edwards 419*; Sg Dolhakim, *Edwards 566*; Jln Gadong, *Edwards 434*; P Punyit, *Wong & Kamariah 11*. **TEM**: K Belalong stream, *De Vogel 8944*. **TUT**: Tg Maya, Jln Tutong-Belait (Pasir Puteh), *Paing BRUN15553*; Tg Maya, Kpg Bkt Udal, *Ariffin et al. BRUN21719*; Telisai, Kpg Telamba, *Ariffin et al. BRUN20764*; Telisai, Pasir Puteh, *Johns RJ6780*; Telisai, Pasir Puteh, *Johns RJ6505*; Telisai, Pasir Puteh, *Johns RJ6790*; Telisai, Jln Tutong-Telisai, *Idris et al. BRUN15856*; Telisai Pasir Puti, *Cicuzza 2521*; Telisai, Kpg Danau, *Kirkup DK788*; Lamunin, *Edwards 967*, *Edwards 969*; Tg Maya, *Nasibah et al. BRUN24571*, *Ariffin et al. BRUN24790*.

Distribution. Old World tropics.

Ecology. Epiphyte, lithophyte, or terrestrial in secondary forests, plantations, and urban areas; near sea level to 2100 m a.s.l. Threat: Least Concern.

Figure 45. Polypodiaceae. *Microsorum scolopendria* (Photo KM. Wong).

26.13. Oreogrammitis Copel., Philipp. J. Sci., C 12: 64: 1917.

Oreogrammitis adspersa (Blume) Parris, Gard. Bull. Singapore 58(2): 255. 2007.

TEM: Bkt Retak, *Johns RJ6632 p.p.*

Distribution. Taiwan, Indonesia (Sumatra, Java, Kalimantan, Sulawesi, Maluku, Indonesian New Guinea), Brunei, Malaysia (Sabah, Sarawak), Philippines, Papua New Guinea, Solomon Islands, Vanuatu, New Caledonia, Fiji.

Ecology. Epiphytic in montane forests (c. 1125 m a.s.l.). Threat: Rare in Brunei.

Oreogrammitis bongoensis (Copel.) Parris, Kew Bull. 65(1): 123. 2010.

TEM: Bkt Retak, *Johns RJ6577.*

Distribution. Brunei, Malaysia (Sarawak), Indonesia (Kalimantan).

Ecology. Epiphyte in montane forest (1300–1350 m a.s.l.). Threat: Rare in Brunei.

Oreogrammitis insularis (Copel.) Parris, Gard. Bull. Singapore 58(2): 261. 2007.

TEM: Bkt Retak, *Wong WKM870 p.p.*, *Johns RJ6611.*

Distribution. Indonesia (Sumatra, Java, Maluku, Indonesian New Guinea), Brunei, Malaysia (Sabah, Sarawak), Papua New Guinea, Samoa.

Ecology. Epiphyte on mossy tree trunks in montane forest (c. 1125 m a.s.l.). Threat: Rare in Brunei.

Oreogrammitis oblanceolata (Baker) Parris, Gard. Bull. Singapore 58(2): 264. 2007.

TEM: Bkt Retak, *Wong WKM825*, *Wong WKM870*, *Johns RJ6632 p.p.*

Distribution. Indonesia (Sumatra, Java, Kalimantan, Maluku, Indonesian New Guinea), Brunei, Malaysia (Sabah, Sarawak), Papua New Guinea, Solomon Islands.

Ecology. Epiphyte on tree trunks in montane forest (c. 1125 m a.s.l.). Threat: Rare in Brunei.

Oreogrammitis reinwardtioides (Copel.) Parris, Kew Bull. 65(1): 123. 2010.

TEM: Bkt Pagon, *Ashton A471.*

Distribution. Brunei, Malaysia (Sabah, Sarawak), Indonesia (Kalimantan).

Ecology. c. 1590 m a.s.l. Threat: Rare in Brunei.

Oreogrammitis sarawakensis (Parris) Parris & Sundue, Phytotaxa 436(1): 50. 2020.

TEM: Bkt Pagon, *Ashton A444.*

Distribution. Brunei, Malaysia (Sarawak).

Ecology. c. 1590 m a.s.l. Threat: Rare in Brunei.

Oreogrammitis torricelliana (Brause) Parris, Gard. Bull. Singapore 58(2): 270. 2007.

TEM: Bkt Retak, *Johns RJ6742.*

Distribution. Brunei, Philippines, Papua New Guinea, Solomon Islands, New Caledonia.

Ecology. Epiphyte in lower montane forest (750–800 m a.s.l.). Threat: Rare in Brunei.

26.14. Platycerium Desv., Mém. Soc. Linn. Paris 6: 213. 1827.

Platycerium coronarium (König ex Müller) Desv., Mém. Soc. Linn. Paris 6: 213. 1827. (Fig. 46).

BRM: Bandar Seri Begawan, *Edwards 494*. **TEM**: Labu, Bkt Patoi (Peradayan FR), *Wong WKM1301*, *Johns RJ7463*; Sg Temburong, *Edwards 634*.

Distribution. Indochina, Malaysia (Malay Peninsula, Sarawak, Sabah), Indonesia (Sumatra, Java, Kalimantan), Philippines.

Ecology. Epiphytic on exposed branches in primary and secondary forest as well as in plantations and disturbed places; near sea level to 500(–1000) m a.s.l. Threat: Least Concern.

Platycerium ridleyi Christ, Ann. Buit. II. Suppl. III. 8 t. 2, 1909.

BEL: Bkt Sawat, Jln Labi (Merangking junction), *Wong WKM967*; Labi, Bkt Teraja, *Johns RJ6901*; **TUT**: Lamunin, Benutan dam, *Edwards 2340*.

Distribution. Thailand, Malaysia (Malay Peninsula, Sarawak, Sabah), Indonesia (Sumatra, Kalimantan).

Ecology. Epiphytic, often with several individuals on a single tree; in humid forest and swamps from near sea level to 200 m a.s.l. Threat: Least Concern.

26.15. Prosaptia C.Presl., Tent. Pterid.: 165. 1836.

Prosaptia alata (Blume) Christ, Bull. Jard. Bot. Buitenzorg, Ser. 2, 5: 127. 1905.

BEL: Melilas, Batu Melintang, *Kessler PK413*; Teraja Forest

Figure 46. Polypodiaceae. *Platycerium coronarium* (Photo KM. Wong).

Reserve, *Hotta MH12702*. **TEM**: Amo, Batu Apoi FR (K Belalong FSC), *Edwards 992*; Amo, Batu Apoi FR (K Belalong FSC), *Edwards 2072*; Amo, K Belalong, *Ashton A23;* Amo, K Belalong, *Wong WKM276*; Amo, K Belalong, *Dransfield SD984*; Amo, Sg Belalong (Amo), *Wong WKM1337*; Amo, K Belalong, *Dransfield SD1016*; Amo, K Belalong, *De Vogel 8927*; Amo, Sg Belalong (Amo), *Wong WKM1335*, *Edwards 2136*; Amo, K Belalong, *Dransfield SD1005*; Amo, Ulu Temburong NP, *Low LYW686*; Bkt Belalong, *De Vogel 9029, Dransfield SD1268*; Sg Belalong, *Johns RJ7008*; Sg Belalong & Sg Temburong, *Jacobs MJ5617*; Sg Temburong above Sg Apan, *Idris et al. BRUN017869*; Sg Enkiang, *Edwards 2072*; Sg Sitam, *Edwards 992*; Bkt Retak, *Johns RJ6593*, *Johns RJ6761*; Sg Temburong, *Johns RJ7168*, *Johns RJ71770*, *Johns RJ7404*; Sg Selapon, *Wong WKM2077*. **TUT**: Sg Ingei, *Edwards 2382*.

Distribution. India, Sri Lanka, Thailand, Vietnam, Indonesia (Sumatra, Java, Kalimantan, Sulawesi, Maluku), Brunei, Malaysia (Malay Peninsula, Sarawak, Sabah), Philippines, Papua New Guinea, the Pacific Islands.

Ecology. A common epiphyte in lowland forest, often along rivers, up to 1000 m a.s.l. Threat: Least Concern.

Prosaptia barathrophylla (Baker) M.G.Price, Contr. Univ. Michigan Herb. 17: 276. 1990.

TEM: Amo, Bkt Retak; *Wong WKM874, Johns RJ6625*.

Distribution. China, Indochina, Indonesia (Sumatra, Java, Lesser Sunda Islands, Kalimantan, Sulawesi), Brunei, Malaysia (Malay Peninsula, Sarawak, Sabah), Philippines, Papua New Guinea.

Ecology. Epiphytic in montane forest (c. 1250 m a.s.l.). Threat: Rare in Brunei.

Prosaptia contigua (G.Forst.) C.Presl, Tentamen: 166 no. 463. 1836.

BEL: Labi, Sg Teraja, *Edwards 800.*

Distribution. China, Taiwan, South India, Sri Lanka, Indonesia (Sumatra, Java, Lesser Sunda Islands, Kalimantan, Sulawesi, Maluku, Indonesian New Guinea), Brunei, Malaysia (Malay Peninsula, Sarawak, Sabah), Philippines, Papua New Guinea, Australia, the Pacific Islands.

Ecology. Epiphyte in montane forest. Threat: Rare in Brunei.

Prosaptia obliquata (Blume) Mett., Reise Novara 1: 214. 1870.

TEM: Amo, Bkt Retak, *Wong WKM872*.

Distribution. China, Taiwan, India, Sri Lanka, Indochina, Indonesia (Sumatra, Java, Lesser Sunda Islands, Kalimantan, Sulawesi, Maluku, Indonesian New Guinea), Brunei, Malaysia (Malay Peninsula, Sarawak, Sabah), Philippines, Papua New Guinea.

Ecology. Epiphyte in montane forest. Threat: Rare in Brunei.

26.16. Pyrrosia Mirb. in J.B.A.M. de Lamarck & C.F.B. de Mirbel, Hist. Nat. Vég. Cl. Fam. 3: 471. 1802.

Pyrrosia angustata (Sw.) Ching, Bull. Chin. Bot. Soc. 1: 49. 1935.

BEL: Labi, Kpg Teraja, *Sands MS5688*; Melilas, Batu Melintang, *Wong WKM657*; Melilas, Kpg Melilas, *Forman LLF1209*; Melilas, Ulu Ingei, *Dransfield SD965*; Melilas, Bkt Batu Patam (Ulu Ingei), *Wong WKM1071*, *Kessler PK403*; Sg Pasir, Sg Ingei, *Kessler PK381*; Sg Ingei, *Kessler PK371*; Sukang, Kpg Buau, *Ariffin et al. BRUN19187*; Sukang, Buau, *Lee 952*. **TEM**: Selirong, *Edwards 894*; Amo, Batu Apoi FR (K Belalong FSC), *Sands MS5842*; Batu Apoi, Sg Temburong-Machang, *Wong WKM1975*; Amo, Sg Temburong, *Wong WKM6640*; Amo, K Belalong, *Dransfield SD1008*; Amo, Sg Belalong (Amo), *Edwards 2172*; Amo, K Belalong, *Johns RJ7006*; Amo, Sg Temburong, *Johns RJ6966*; Amo, Sg Sibut, *Johns RJ6908*; Amo, Batu Apoi FR (K Belalong FSC), *Poulsen ADP5*; Amo, Batu Apoi FR (K Belalong FSC), *Hansen CH1503*; Amo, K Belalong, *Ashton A22*; Amo, K Belalong, *Ashton A5*; Bangar, Pekan Bangar; *Edwards 866*; Batu Apoi, Sg Selapon, *Wong WKM2089*; Batu Apoi, Bkt Gelagas (Bkt Suang), *Simpson 2334*; FSC, *Wong WKM3309*; Amo, Belalong FSC, *Cicuzza 2625*. **TUT**: Lamunin,

Benutan dam, *Edwards 2231*; Lamunin, Ladan Hills FR, *Johns RJ7100*; Rambai, Sg Medit, *Simpson 2584*; Rambai, Ulu Tutong, *Johns RJ7532*; Rambai, Ulu Tutong, *Johns RJ7493*; Amo, Belalong, FSC, *Cicuzza 2514*.

Distribution. Thailand, Malaysia (Malay Peninsula, Sarawak, Sabah), Brunei, Indonesia (Sumatra, Kalimantan, Maluku); not confirmed in Java and New Guinea.

Ecology. Epiphytic in forests, also lithophytic, or terrestrial on sand; sea level to 900 m a.s.l. Threat: Least Concern.

Pyrrosia christii (Giesenh.) Ching, Bull. Chin. Bot. Soc. 1: 58. 1935.

TEM: Amo, Batu Apoi FR (K Belalong FSC), *Edwards 2185*; Amo, Batu Apoi FR (K Belalong FSC), *Edwards 2069*; Amo, Batu Apoi FR (K Belalong FSC), *Edwards 2004*; Amo, K Belalong, *Ashton A54*, *Edwards 2110*; Amo, Sg Temburong, *Johns RJ7193*, *Hovenkamp BR008*.

Distribution. Endemic to Borneo (Brunei, Kalimantan, Sabah, Sarawak).

Ecology. Mainly epiphytic, sometimes lithophytic; in shady areas or open sites between 300–1150 m a.s.l. Threat: Least Concern.

Pyrrosia lanceolata (L.) Farw., Amer. Midl. Naturalist 12(8): 245. 1930.

(=) *Pyrrosia adnascens* (Sw.) Ching. Bull. Chin. Bot. Soc. 1(1): 45–46. 1935.

BEL: Bkt Sawat, Jln Labi (Bkt Sawat), *Idris et al. BRUN15846*; Liang, Kpg Sg Liang, *Junaidi et al. BRUN18914*; Seria, Anduki, *Idris et al. BRUN15864*. **BRM**: Serasa, Jln Tg Batu, *Edwards 2323*, *Edwards 567*; Jln Residency, *Edwards 446*; P Berambang, *Edwards 617*. **TEM**: Amo, Batu Apoi FR (K Belalong FSC), *Edwards 2075*; Amo, Sg Temburong, *Johns RJ6947*, *Johns RJ7245*; Amo, K Belalong, *De Vogel 8928*; Bangar, Bkt Bangar, *Johns RJ7037*; Batu Apoi, Kpg Selapon, *Dransfield SD1157*; Sg Baki, *Edwards 2152*; Sg Dolhakim, *Edwards 567*, *Edwards 583*. **TUT**: Telisai, Pasir Puteh, *Ariffin ARK4*; Telisai, Kpg Telamba, *Ariffin et al. BRUN20746*; Rambai, Sg Medit, *Simpson 2623*; Merimbun, Sg Padang, *Edwards 666*; Sg Lamunin, *Edwards 738*.

Distribution. Old World tropics.

Ecology. Epiphytic, sometimes lithophytic, rarely terrestrial; common in a broad range of habitats, mainly in the lowlands on trees along streams and rivers, but can be found at altitudes of up to 1500 m a.s.l. Threat: Least Concern.

Pyrrosia longifolia (Burm.f.) C.V.Morton, J. Wash. Acad. Sci. 36: 168. 1946. (Fig. 47).

BEL: Labi, Bkt Teraja, *Johns RJ6892*; Labi, Bkt Teraja, *Johns RJ6899*; Liang, Andulau FR (Sg Liang), *Ashton A142*; Liang, Andulau FR (Sg Liang), *Idris et al. BRUN15274*; Melilas, Kpg Melilas, *Forman LLF1210*; Melilas, Bkt Batu Patam (Ulu Ingei), *Wong WKM1096*; Arboretum, Sg Liang, *Edwards 485*. **BRM**: Angrek Hotel, *Edwards 404*; Berakas, *Edwards 793*. **TEM**: Amo, Sg Temburong, *Idris et al. BRUN15299*; Amo, Sg Temburong, *Wong WKM1308*; Amo, K Belalong, *Dransfield SD986*; Amo, Sg Temburong, *Wong WKM467B*; Batu Apoi, Bkt Gelagas (Bkt Suang), *Simpson 2273*, *Idris et al. BRUN18786*; Sg Dolhakim, *Edwards 571*; Bkt Belalong, *Edwards & Cantley 841*; Sg Belalong, *Edwards 2173*; Amo, Belalong, *Cicuzza 2517*. **TUT**: Rambai, Sg Tutong (Belabau), *Wong WKM1692*; Rambai, Kpg Merimbun, *Edwards 607*; Rambai, Sg Medit, *Simpson 2538*; Rambai, Bkt Bahak, *Coode MC7101*; Rambai, Ulu Tutong, *Johns RJ7586*; Telisai, Kpg Danau, *Forman LLF1013*; Kpg Merimbun, *Edwards 607*.

Distribution. Indochina, throughout Malesia, to Australia and the Pacific islands.

Ecology. Epiphytic, rarely lithophytic or terrestrial, in a broad range of habitats including lowland mangrove forest; up to 300(–1000) m a.s.l. Threat: Least Concern.

Pyrrosia nummulariifolia (Sw.) Ching, Bull. Chin. Bot. Soc. 1: 47. 1935.

BEL: Labi, Sg Teraja, *Edwards 698*. **TEM**: Amo, Batu Apoi FR (K Belalong FSC), *Edwards 2193*; Amo, K Belalong, *De Vogel 8920*; Sg Baki, *Hovenkamp BR010*.

Figure 47. Polypodiaceae. *Pyrrosia longifolia* (Photo D. Cicuzza).

Distribution. India, Bhutan, China, Indochina, Malaysia (Malay Peninsula, Sarawak, Sabah), Brunei, Indonesia (Sumatra, Java, Lesser Sunda Islands, Kalimantan, Sulawesi), Philippines.

Ecology. Epiphytic or lithophytic in exposed sites from near sea level to 1200 m a.s.l. Threat: Least Concern.

Pyrrosia piloselloides (L.) M.G.Price, Kalikasan 3: 176. 1974.

BEL: Bkt Sawat, Bkt Sawat, *Azlan et al. BRUN20514*; Labi, Kpg Tenajor, *Niga s.n.* **BRM**: UBD campus, *Hamid NAH2*. **TEM**: Bangar, Bkt Bangar, *Johns RJ7041*. **TUT**: Rambai, Tasek Merimbun, *Hussain et al. BRUN15685*; Ukong, Kpg Ukong, *Johns RJ7085*.

Distribution. India to China, Indochina, throughout Malesia.

Ecology. Epiphytic (sometimes lithophytic) in primary and secondary forests and other disturbed vegetation; near sea level to 1000 m a.s.l. Threat: Least Concern.

26.17. Scleroglossum Alderw., Bull. Jard. Buitenzong, sér. 2, 7: 37. 1912.

Scleroglossum crassifolium (Baker) C. Chr., Gard. Bull. Straits. Settlem. 4:407. 1929.

TEM: Amo, Bkt Retak, *Johns RJ6574 p.p.*, *Johns RJ6576 p.p.*, *Johns RJ6630*, *Johns RJ6661*; *Wong WKM797*, *Wong WKM875*, *Wong et al. BRUN016548*.

Distribution. Brunei, Malaysia (Sarawak).

Ecology. Epiphyte in montane forest (1250–1370 m a.s.l.). Threat: Rare in Brunei.

Scleroglossum pusillum (Blume) Alderw., Bull. Jard. Bot. Buitenzorg 2, 7: 39 t. 5 f. 1-2. 1912.

TEM: Bkt Retak, *Johns RJ6562*.

Distribution. China, Sri Lanka, Indochina, throughout Malesia, Solomon Islands.

Ecology. Epiphyte in montane forest (1300–1350 m a.s.l.). Threat: Rare in Brunei.

Scleroglossum pyxidatum Alderw., Bull. Jard. Bot. Buitenzorg 2, 16: 37. 1914.

TEM: Bkt Belalong, *Argent GA91159*; Bkt Retak, *Johns RJ6536*, *Johns RJ6636 p.p.*, *Said et al. BRUN15802*, *Wong WKM402*, *Wong WKM759*; G Pagon, *Wong WKM1800*.

Distribution. Vietnam, Indonesia (Sumatra, Java, Sulawesi), Brunei, Malaysia (Sabah, Sarawak).

Ecology. Epiphyte on mossy trunks in montane forest (1060–1370 m a.s.l.). Threat: Least Concern.

Scleroglossum sulcatum (Kuhn) Alderw., Bull. Jard. Bot. Buitenzorg 2, 7: 39. 1912.

BEL: N of Batu Patam, *Wong WKM1105*; Bkt Teraja, *Johns RJ6874*. **TEM**: Bkt Retak, *Johns RJ6515*, *Johns RJ6574 p.p.*, *Johns RJ6663*, *Johns RJ6665*, *Wong WKM765*; G Pagon, *Wong WKM1794*; Temburong River valley, *Johns RJ7230*, *Johns RJ7344*. **TUT**: Rambai, Ulu Tutong, *Johns RJ7534*.

Distribution. China, Sri Lanka, Indochina, throughout Malesia, the Pacific Islands.

Ecology. Epiphyte on mossy tree trunks, or terrestrial in lowland and hill dipterocarp forest and montane forest (50–1480 m a.s.l.). Threat: Least Concern.

26.18. Selliguea Bory, Dict. Class. Hist. Nat. 6: 587. 1824.

Selliguea albidopaleata (Copel.) Parris, Pl. Mt. Kinabalu 1: 151. 1992.

TEM: Amo, G Pagon, *Coode MC7435*, *Ariffin ARK130*, *Booth P02*.

Distribution. Borneo (Brunei, Kalimantan, Sabah, Sarawak), Maluku.

Ecology. Epiphyte or terrestrial in lower montane forest between 1250–2850 m a.s.l. Threat: Least Concern.

Selliguea albidosquamata (Blume) Parris., Pl. Mt. Kinabalu 1: 152. 1992.

TEM: Amo, Bkt Retak, *Johns RJ6764*, *Wong WKM890*; Amo, K Belalong, *Wong WKM1319*; Amo, Batu Apoi FR (K Belalong FSC), *Edwards 2001*; Sg Enkiang, *Edwards 2076*.

Distribution. Throughout Malesia, Solomon Islands.

Ecology. In primary forest, secondary forest, and scrubland, often near streams; lowlands to 3500 m a.s.l. Threat: Least Concern.

Selliguea ceratophylla (Copel.) Hovenkamp, Blumea 43(1): 86. 1998.

TEM: Amo, Bkt Belalong, *Dransfield SD1269*; Amo, Bkt Belalong, *Wong WKM1527*; Amo, Bkt Belalong, *Wong WKM1525*; Amo, Bkt Belalong, *De Vogel 9017*; Amo, Bkt Belalong, *De Vogel 9014*. **TUT**: Rambai, Ulu Tutong, *Johns RJ7611*.

Distribution. Malaysia (Malay Peninsula, Sarawak, Sabah), Brunei, Indonesia (Sumatra, Kalimantan).

Ecology. Epiphytic, rarely terrestrial, in mature forests between 650–1900 m a.s.l. Threat: Least Concern.

Selliguea enervis (Cav.) Ching, Bull. Fan Mem. Inst. Biol. Bot. 10: 239. 1941.

TEM: Amo, Bkt Belalong, *Dransfield SD1244*, *Dransfield SD1251*, *Wong WKM1470*, *Wong WKM1526*, *Wong WKM1533*; Amo, G Pagon, *Wong WKM1795*.

Distribution. Indochina, throughout Malesia, Solomon Islands.

Ecology. Epiphytic, rarely lithophytic, in various types of forests between 280–3500 m a.s.l. Threat: Least Concern.

Selliguea heterocarpa Blume, Enum. Pl. Javae 2: Add. 1828. (Fig. 48).

TEM: Amo, Bkt Retak, *Wong WKM866*; Telisai Pasir Puti, *Cicuzza 2525*.

Distribution. Indochina, throughout Malesia.

Ecology. Epiphyte in various types of montane forests between 1200–2000 m a.s.l. Threat: Rare in Brunei

Selliguea lateritia (Baker) Hovenkamp, Blumea 43(1): 71. 1998.

BEL: Seria, Pekan Seria, *Edwards 917*; Bkt Sawat, Sg Mau SL, *Ariffin et al. BRUN20779*; Bkt Sawat, Jln Labi (km 13), *Idris et al. BRUN19546*; Labi, Jln Labi, *Edwards 2046*; Melilas, Sg Ingei, *Edwards 2374*; Melilas, Sg Ingei, *Edwards 2356*; Melilas, Batu Melintang, *Kessler PK388*; Melilas, Ulu Ingei, *Sands MS5926*; Melilas, K Ingei, *Kirkup DK784*; Seria, Badas FR, *Wong WKM7*; Sg Teraja, *Edwards 700*. **TEM**: Sg Enkiang, *Edwards 2079*; Amo, Sg Temburong, *Johns RJ7300*; Amo, Bkt Retak, *Johns RJ6582*; Amo, Bkt Retak, *Wong WKM798*; Amo, Sg Temburong, *Idris et al. BRUN15604*; Bkt Patoi, *Edwards 872*; Amo, Sg Temburong, *Johns RJ7163*; Amo, Sg Temburong, *Johns RJ7205*; Amo, K Belalong, *Dransfield SD977*; Amo, K Belalong, *Dransfield SD978*; Amo, K Belalong, *Dransfield SD1004*; Amo, Sg Belalong (Amo), *Wong WKM1334*; Amo, Sg Temburong, *Coode MC6690*; Batu Apoi, Sg Selapon, *Wong WKM2080*; Amo, Batu Apoi FR (K Belalong FSC), *Edwards 2009*; Amo, Sg Temburong, *Wong WKM462*; Amo, Bkt Retak, *Wong WKM778*; Amo, Bkt Retak, *Wong WKM799*; Batu Apoi, Sg Temburong-Machang, *Wong WKM1957*; Amo, K Belalong, *Johns RJ7007*; Amo, K Belalong, *Johns RJ7024*; Amo, K Belalong, *Johns RJ7030*; Amo, G Pagon, *Coode MC7542*; Amo, G Pagon, *Wong WKM1771*; Amo, Bkt Retak, *Johns RJ6549*; Amo, Sg Temburong, *Coode MC6516*; Amo, K Belalong, *Dransfield SD1009*; Amo, Batu Apoi FR (K Belalong FSC), *Poulsen ADP179*; Amo, Batang Duri, *Schatz GS3289*; Amo, Bkt Lutut LP297, *Ariffin et al. BRUN20812*; Batu Apoi, Bkt Gelagas (Bkt Suang), *Simpson 2219*; Batu Apoi, Sg Temburong (Batu Apoi), *Edwards 2161*; Batu Apoi, Bkt Gelagas (Bkt Suang), *Simpson 2432*; Batu Apoi, Bkt Gelagas (Bkt Suang), *Simpson 2332*; Labu, Bkt Patoi (Peradayan FR), *Dransfield SD975*; Labu, Bkt Patoi (Peradayan FR), *Ashton A123*; Labu, Peradayan FR, *Ariffin et al. BRUN19908*; G Pagon, *Booth P26*. **TUT**: Rambai, Ulu Tutong, *Johns RJ7601*; Rambai, Ulu Tutong, *Johns RJ7533*.

Distribution. Indochina, throughout Malesia.

Figure 48. Polypodiaceae. *Selliguea heterocarpa* (Photo D. Cicuzza).

Ecology. Epiphyte, lithophyte, or terrestrial in various types of forests and along rivers from near sea level to 1200 m a.s.l. Threat: Least Concern.

Selliguea leucophora (Baker) Christenh., Global Fl. 4: 51. 2018.

TEM: Amo, Sg Temburong, *Johns RJ7273*; Amo, Sg Temburong, *Johns RJ7172*.

Distribution. Endemic to Borneo (Brunei, Kalimantan, Sarawak).

Ecology. Epiphyte in shady mature forests between 200–450 m a.s.l. Threat: Rare in Brunei.

Selliguea oodes (Kunze) Hovenkamp, Blumea 43(1): 89. 1998.

TEM: Amo, Sg Temburong, *Coode MC6491*; Amo, Bkt Retak, *Johns RJ6722*.

Distribution. Malaysia (Sarawak, Sabah), Brunei, Indonesia (Kalimantan, Sulawesi), Philippines.

Ecology. Lithophytic, rarely epiphytic, often in river beds; between 600–1500 m a.s.l. Threat: Least Concern.

Selliguea rigida (Hook.) Hovenkamp, Blumea 43(1): 92. 1998.

TEM: Amo, Ulu Belalong, *Idris et al. BRUN16653*.

Distribution. Endemic to Borneo (Brunei, Kalimantan, Sarawak).

Ecology. Epiphyte in kerangas and lowland dipterocarp forest to 380 m a.s.l. Threat: Rare in Brunei.

Selliguea setacea (Copel.) Hovenkamp, Blumea 43(1): 72. 1998.

TEM: Amo, Sg Temburong, *Johns RJ7173*; Amo, Sg Temburong, *Johns RJ7250*; Amo, Sg Temburong, *Wong WKM1706*; Amo, Sg Temburong, *Wong WKM464*; Amo, Bkt Belalong, *De Vogel 8985*. **TUT**: Sg Ingei, *Edwards 2823*.

Distribution. Endemic to Borneo (Brunei, Sarawak).

Ecology. Epiphyte in hill summit of dry or heath forests between 150–1900 m a.s.l. Threat: Least Concern.

Selliguea soridens (Hook.) Parris, Malayan Nat. J. 50(4): 267. 1997.

TEM: Amo, Bkt Tudal, *Idris et al. BRUN15826*; Amo, Bkt Retak, *Johns RJ6541*; Amo, Bkt Retak, *Wong WKM s.n.*; Amo, G Pagon, *Coode MC7499*; Amo, G Pagon, *Wong WKM1770*; Amo, Bkt Retak, *Johns RJ6766*; Amo, Bkt Retak, *Johns RJ6671*; Amo, Bkt Retak, *Johns RJ6581*; Amo, Bkt Retak, *Wong WKM756*; Amo, Bkt Retak, *Wong WKM731*; Amo, Bkt Retak, *Edwards 825*; Amo, G Pagon, *Edwards 725*, *Booth P35*; Amo, G Pagon Periok, *Ashton A288*.

Distribution. Malaysia (Sarawak, Sabah), Indonesia (Kalimantan, Sulawesi, Maluku).

Ecology. Epiphyte, lithophyte, or terrestrial in montane or mossy forest between 750–3150 m a.s.l. Threat: Least Concern.

Selliguea sri-ratu Hovenkamp, Blumea 41(1): 19. 1996.

TEM: Amo, Bkt Retak, *Johns RJ6765*.

Distribution. Endemic to Borneo (Brunei, Kalimantan).

Ecology. Epiphytic in mature dipterocarp forests between 660–960 m a.s.l. Threat: Least Concern.

Selliguea stenophylla (Blume) Parris, Pl. Mt. Kinabalu 1: 151. 1992.

TEM: Amo, Bkt Belalong, *Dransfield SD1242*, *Edwards & Cantley 840*; Amo, Ulu Belalong LP382, *Dransfield JD7369*; Amo, Sg Temburong, *Johns RJ7339*; Amo, Sg Temburong, *Coode MC6518*; Amo, Bkt Belalong, *De Vogel 9026*; Amo, Bkt Retak, *Wong s.n.*; Amo, Sg Temburong, *Johns RJ7342*; Amo, Bkt Tudal, *Davis APD462*; Bkt Belalong, *Samhan SN2*, *Simpson 2316*; Batu Apoi, Bkt Gelagas (Bkt Suang), *Simpson 2217*. **TUT**: Lamunin, Ladan Hills FR, *Joffre et al. BRUN18276*.

Distribution. Indochina, throughout Malesia.

Ecology. Epiphytic, rarely terrestrial, between 100–2550 m a.s.l. Threat: Least Concern.

Selliguea subsparsa (Baker) Hovenkamp, Blumea 43(1): 80. 1998.

TEM: Amo, Bkt Belalong, *De Vogel 8977*; Amo, Bkt Retak, *Johns RJ6672A*.

Distribution. Malay Peninsula, Brunei, Indonesia (Sumatra, Kalimantan, Sulawesi).

Ecology. Epiphyte or lithophyte; in montane or summit forests between 1200–1500 m a.s.l. Threat: Least Concern.

Selliguea taeniata (Sw.) Parris, Pl. Mt. Kinabalu 1: 152. 1992.

(=) *Polypodium lepidosorum* C. Chr., Leafl. Philipp. Bot. 9: 3166. 1933.

(=) *Polypodium mjöbergii* C. Chr., Dansk Bot. Ark. 9: 70. 1937.

(=) *Phymatopteris pakkaensis* (C. Chr.) Parris, Pl. Mt. Kinabalu 1: 107. 1992.

BEL: Labi, Labi Hills FR, *Idris et al. BRUN18756*. **TEM**: Amo, Bkt Retak, *Johns RJ6666*; Amo, Bkt Retak, *Johns RJ6642*; Amo, Sg Temburong, *Johns RJ7383*; Amo, Sg Temburong, *Johns RJ7164*; Amo, G Pagon; *Ariffin ARK134*; Amo, Bkt Retak, *Johns RJ6597*; Amo, G Pagon, *Wong WKM1789*; Amo, Sg Temburong, *Coode MC6548*; Amo, Bkt Belalong, *Dransfield SD1233*; Amo, Bkt Retak, *Johns RJ6711*; Amo, G Pagon, *Ariffin ARK141*; Amo, Bkt Tudal, *Idris et al. BRUN15801*; Amo, Bkt Belalong, *De Vogel 9013*; Amo, Bkt Retak, *Wong WKM844*; Amo, Bkt Belalong, *De Vogel 9022*; Amo, Bkt Belalong, *Wong WKM1471*; Amo, Bkt Retak, *Wong WKM751*; Amo, Ulu Temburong, *Wong WKM s.n.*; Amo, Bkt Retak, *Wong WKM407*; Amo, Bkt Retak, *Wong, WKM406*; Amo, Bkt Retak, *Edwards 861*; Amo, Bkt Belalong, *Edwards 2314*; Batu Apoi, Bkt Gelagas (Bkt Suang), *Simpson 2315*; Amo, Batu Apoi, *Samhan SN91*; Sg Enkiang, *Edwards 2093*; G Pagon, *Booth P36*; Bkt Retak, *Edwards 823*. **TUT**: Rambai, Ulu Tutong, *Kirkup DK576*; Rambai, Ulu Tutong, *Johns RJ7636*.

Distribution. Taiwan, Thailand, throughout Malesia.

Ecology. Epiphyte or terrestrial in forests or along roadsides; lowlands to 3400 m a.s.l. Threat: Least Concern.

Selliguea triloba (Houtt.) M.G.Price, Contr. Univ. Michigan Herb. 17: 276. 1990.

TEM: Amo, G Pagon, *Ariffin ARK129*; Batu Apoi, Bkt Gelagas (Bkt Suang), *Simpson 2270*; Amo, Bkt Retak, *Wong WKM823*; Amo, Batu Apoi FR, *Idris et al. BRUN18787*; Batu Apoi, Bkt Gelagas (Bkt Suang), *Simpson 2267*; Bkt Belalong, *Edwards 2317*.

Distribution. China, Indochina, Malaysia (Malay Peninsula, Sarawak, Sabah), Indonesia (Sumatra, Java, Kalimantan, Maluku), Philippines.

Ecology. Epiphyte, lithophyte, or terrestrial in primary or secondary forests between 540–3200 m a.s.l. Threat: Least Concern.

26.19. Thylacopteris Kunze ex J.Sm., Hist. Fil.: 87. 1875.

Thylacopteris papillosa (Blume) J.Sm., Hist. Fil. 87. 1875.

TEM: Amo, Batu Apoi FR, *Idris et al. BRUN18778, Samhan SN12*; Amo, Bkt Retak, *Johns RJ6677*; Batu Apoi, Sg Temburong-Machang, *Wong WKM1945*; Amo, Sg Belalong (Amo), *Edwards 2129*.

Distribution. Throughout Malesia except New Guinea.

Ecology. Epiphyte or lithophyte, always in shaded areas; lowlands to 1500(–3500) m a.s.l. Threat: Least Concern.

26.20. Tomophyllum (E.Fourn.) Parris, Gard. Bull. Singapore 58: 245. 2007.

Tomophyllum minutum (Blume) Parris, Gard. Bull. Singapore 58(2): 247. 2007.

TEM: Amo, Sg Temburong, *Coode MC6492*; Bkt Retak, *Wong WKM873*.

Distribution. Indonesia (Sumatra, Java), Brunei, Malaysia (Sarawak).

Ecology. Epiphyte in mixed lowland forest and montane forest (120–1350 m a.s.l.). Threat: Rare in Brunei.

Tomophyllum subrepandulum (Christ) Parris, Gard. Bull. Singapore 58(2): 249. 2007.

TEM: Amo, Ulu Belalong, *Dransfield JD7361*; Ulu Temburong, *Wong WKM3353*.

Distribution. Indonesia (Java, Kalimantan, Sulawesi, Maluku, Indonesian New Guinea), Brunei, Malaysia (Sarawak), Papua New Guinea, and the Solomon Islands.

Ecology. Epiphyte in lowland dipterocarp forest and upland mixed dipterocarp forest in transition to lower montane forest (450–1000 m a.s.l.). Threat: Rare in Brunei.

26.21. Xiphopterella Parris, Gard. Bull. Singapore 58: 249. 2007.

Xiphopterella murudensis (Copel.) Parris, Bull. Nat. Mus. Sci. Tokyo, B. 38(3): 119. 2012.

TEM: Bkt Retak, *Johns RJ6638*, *Johns RJ6740*; Amo, Temburong westward toward G Pagon LP 307, *Wong WKM1827*.

Distribution. Borneo (Brunei, Kalimantan, Sabah, Sarawak).

Ecology. Epiphyte or lithophyte in montane forests (750–1125 m a.s.l.). Threat: Rare in Brunei.

Family 27. PSILOTACEAE

27.1. Psilotum Sw., J. Bot. (Schrader) 1800(2): 8, 109. 1801.

Psilotum complanatum Sw., J. Bot. (Schrader) 1800(2): 110. 1801.

BRM: Sg Dolhakim, P Berambang (HUBD), *Edwards 558*. **TEM**: Batu Apoi, Bkt Gelagas (Bkt Suang), *Simpson 2223*.

Distribution. Thailand, thoughout Malesia, Australia, to the Pacific islands, and New World tropics.

Ecology. Epiphyte along shore and coastal vegetation to 400 m a.s.l. Threat: Rare in Brunei.

Psilotum nudum (L.) P.Beauv., Prod. Aethéogam. 112. 1805.

BRM: Berakas, Berakas, *Vermeulen 1260*; Sg Dolhakim, *Edwards 556*. **TUT**: Ukong, Jln Rampau (Sg Padang), *Edwards 786*.

Distribution. World-wide in tropical and subtropical regions.

Ecology. Lowlands, in primary and secondary forests, parks, and plantations. Threat: Least Concern.

Family 28. PTERIDACEAE

28.1. Acrostichum L., Sp. Pl.: 1067. 1753.

Acrostichum aureum L., Sp. Pl. 2: 1069. 1753. (Fig. 49).

BRM: Serasa, Muara (Brunei Bay), *Johns RJ7081*. **TEM**: Labu, Peradayan FR, *Johns RJ7046A*; P Berambang, *Edwards 618*. **TUT**: Lamunin, Ladan Hills FR, *Watu et al. BRUN21424*; Lamunin, Benutan dam, *Edwards 2330*.

Distribution. Pantropical.

Ecology. A lowland species common in mangrove forests and estuary rivers, it is also present in water bodies of urban areas such as drainages and channels. Threat: Least Concern.

Acrostichum speciosum Willd., Sp. Pl., ed. 5: 117. 1810. (Fig. 50).

BRM: Jln Mulaut, *Edwards 405*; Jln Gadong, *Edwards 417*; Kapok Kanan, *Grindrod JG4*, *Edwards 2473*. **TUT**: Telisai, Kpg Telisai, *Idris et al. BRUN15908*; Telisai, Kpg Danau, *Forman LLF1011*.

Distribution. West Indian Ocean Islands, throughout Malesia to Australia and Pacific Islands.

Figure 49. Pteridaceae. *Acrostichum aureum* (Photo D. Cicuzza).

Figure 50. Pteridaceae. *Acrostichum speciosum* (Photo KM. Wong).

Ecology. Similar to *A. aureum* in mangrove forest within mangrove vegetation but preferring slightly less inundated sites. Threat: Least Concern.

28.2. **Antrophyum** Kaulf., Enum. Filic.: 197. 1824.

Antrophyum callifolium Blume, Enum. Pl. Javae 2: 111. 1828. (Fig. 51).

BEL: Bkt Sawat, Ulu Sg Singap, *Hairun BRUN22228*; Labi, Labi Hills FR, *Ariffin et al. BRUN22561*; Melilas, Sg Ingei, *Kessler PK423*; Sg Teraja, *Edwards 695*; Sg Sagat, *Wong WKM3224*; Labi, Wasai Wong Kadir, *Cicuzza 2589*, *Cicuzza 2668*. **TEM**: Amo, Ulu Belalong, *Idris et al. BRUN16669*; Sg Temburong, *Edwards 637*; Amo, Batu Apoi FR, *Sands MS5818*; Amo, Sg Belalong (Amo), *Wong WKM1168*; Amo, Batang Duri, *Edwards 2394*; Amo, Sg Belalong (Amo), *Middleton DJM759*; Amo, Sg Temburong, *Johns RJ6951*; Amo, Batu Apoi FR, *Sands MS5806*; Amo, Batu Apoi FR (K Belalong FSC), *Edwards 2006*; Amo, Batu Apoi FR (K Belalong FSC), *Edwards 2028*; Amo, Batu Apoi FR (K Belalong FSC), *Edwards 2027*; Amo, K Belalong, *Johns RJ7029*; Batu Apoi, Bkt Gelagas (Bkt Suang), *Simpson 2328*; Batu Apoi, Selapon (Bkt Beliton), *Dransfield JD7446*; Batu Apoi, Bkt Gelagas (Bkt Suang), *Simpson 2433*; Batu Apoi, Kpg Selapon, *Dransfield SD1156*; Labu, Peradayan FR, *Johns RJ7057*; Bkt Patoi, *Edwards 2250*; Sg Belalong, *Edwards 2122*, *Edwards 2104*; Sg Belalong, FSC, *Edwards 22101*; Batu Apoi, *Samhan SN17*, *Samhan SN13*. **TUT**: Lamunin, Ladan Hills FR, *Ariffin et al. BRUN17584*; Lamunin, Ladan Hills FR, *Wong WKM1672*, *Edwards 755*, *Edwards 960*; Ulu Sg Medit, *Jangarun BRUN22855*.

Distribution. China, Indochina, throughout Malesia, Australia, the Pacific Islands.

Ecology. Epiphyte in primary forest, sometimes also in disturbed sites; lowlands. The species has a broad morphological variability within the samples collected in Brunei. Threat: Least Concern.

Antrophyum semicostatum Blume, Enum. Pl. Javae 2: 110. 1828.

TEM: Amo, Bkt Retak, *Johns RJ6671A*; Amo, Bkt Retak, *Johns RJ6739*; Amo, Bkt Retak, *Johns RJ6616A*; Amo, Bkt Retak, *Wong WKM893*.

Distribution. Throughout Malesia, to the Pacific Islands.

Ecology. In mature tropical forest. Threat: Rare in Brunei.

Figure 51. Pteridaceae. *Antrophyum callifolium* (Photo KM. Wong).

Figure 52. Pteridaceae, *Ceratopteris thalictroides* (Photo D. Cicuzza).

Antrophyum subfalcatum Brack., U.S. Expl. Exped., Filic. 16: 65. 1854.

TEM: Amo, K Belalong, *Johns RJ7012*.

Distribution. Malaysia (Sabah, Sarawak), Brunei, Indonesia (Kalimantan, Maluku), Papua New Guinea, Australia (Queensland), the Pacific Islands.

Ecology. Epiphyte on tree trunks in lowland primary forest. Threat: Rare in Brunei.

28.3. Ceratopteris Brongn., Bull. Sci. Soc. Philom. Paris 1821: 186. 1821.

Ceratopteris thalictroides (L.) Brongn., Bull. Sci. Soc. Philom. Paris 8: 186. 1821. (Fig. 52).

BRM: MISSR, Muara, *Edwards 639*. **TUT**: Keriam, Muara-Tutong Highway, *Idris et al. BRUN15878*; Lamunin, Kpg Layong, *Edwards 965*; Benutan Reservoir, *Edwards 926*; Lamunin, Kpg Lamunin, *Wong WKM1921*; Kpg Batang, *Edwards 2574*.

Distribution. Pantropical.

Ecology. Common along shores of lakes or ponds, channels, and wet habitats. Threat: Least Concern.

28.4. Cheilanthes Sw., Syn. Fil. (Kiliae): 5, 126. 1806.

Cheilanthes tenuifolia (Burm.f.) Syn. Fil. 129, 332. 1806.

BRM: Tasek Gorge, *Edwards 528*. **TUT**: Lamunin Pipeline, *Edwards 2043*.

Distribution. Sri Lanka, India, Nepal, China, Thailand, Malaysia (Malay Peninsula, Sabah), Brunei, Indonesia (Sumatra, Java, Lesser Sunda Islands, Maluku, Indonesian New Guinea), Philippines, Papua New Guinea, Australia, and the Pacific Islands.

Ecology. Along rivers, and humid sites in open areas. Threat: Least Concern.

28.5. Haplopteris C.Presl, Tent. Pterid.: 141. 1836, *nom. cons.*

Haplopteris angustifolia (Blume) E.H.Crane, Syst. Bot. 22(3): 514, 1998.

BEL: Labi, Sg Rampayoh, *Coode MC7805*; Amo, Belalong FSC, *Cicuzza 2623*. **TEM**: Amo, Sg Temburong, *Johns RJ7334*; Amo,

Ulu Belalong, *Idris et al. BRUN16656*; Amo, Belalong ridge, *De Vogel 8936*.

Distribution. Indochina, throughout Malesia.

Ecology. Epiphytic, sometimes lithophytic, in primary forests and lowland areas. Threat: Least Concern.

Haplopteris dareicarpa (Hook.) S.Linds. & C.W.Chen, Gard. Bull. Singapore 66(2): 171. 2014.

BEL: Sg Teraja, *Edwards 805, Edwards 2541*; PSF, Seria, *Edwards 920*. **TEM**: Obud dam, *Edwards 2397*; Bkt Patoi, *Edwards 885*. **TUT**: Lamunin, *Edwards 756*.

Distribution. Malesia, the Pacific Islands and Australia.

Ecology. Epiphyte in mature forests, humid forest sites, and along streams. Threat: Least Concern.

Haplopteris elongata (Sw.) E.H.Crane, Syst. Bot. 22(3): 514. 1998.

BEL: K Belait, Sg Belait, *Dransfield SD1124*; Seria, Pekan Seria, *Edwards 919*; Labi, Wasai Mendaram, *Johns RJ6801*; Labi, Wasai Wong Kadir (= Wasai Rampayoh), *Johns RJ7443*; Labi, Bkt Teraja, *Johns RJ6873*; Labi, Wasai Wong Kadir, *Cicuzza 2672*. **BRM**: Kumbang Pasang, Jln Kumbang Pasang, *Johns RJ7068*; Mentiri, Jln Muara, *Edwards 552*; Sg Tilong, Jln Muara, *Edwards 539*; Sg Layong, Kpg Rambai, *Edwards 474*; Labi hill, *Cicuzza 2689*. **TEM**: Amo, Sg Temburong, *Dransfield SD1026*; Amo, Sg Belalong, *Wong WKM1338*; Amo, Sg Temburong, *Johns RJ6942*; Amo, Sg Temburong, *Sands MS5539*; Amo, Bkt Retak, *Wong WKM s.n.*; Amo, K Belalong, *Johns RJ7004*; Amo, Batu Apoi FR (K Belalong FSC), *Edwards 2038*; Amo, Sg Temburong, *Coode MC6524*; Amo, Sg Temburong, *Edwards 633*; Amo, Batu Apoi FR (K Belalong FSC), *Edwards 2071*; Bangar, Bkt Bangar, *Johns RJ7042*; Batu Apoi, Bkt Gelagas (Bkt Suang), *Simpson 2326*; Batu Apoi, Sg Selapon, *Wong WKM2039*; Amo, Batu Apoi FR, Sg Temburong-Machang, *Wong WKM2002*; Bandar, Forest area (wildlife park), *Edwards 502*; Amo, Belalong, *Cicuzza 2611*. **TUT**: Rambai, Sg Medit, *Simpson 2613*; Rambai, Sg Tutong, *Wong WKM1662*; Rambai, Sg Medit, *Simpson 2560*; Merimbun Lake, *Cicuzza 2540*; Kago dam, *Cicuzza 2651*.

Distribution. Old World tropics.

Ecology. Epiphyte on tall trees in primary and secondary forest, sometimes in plantations or parks; between 5–600 m a.s.l. Threat: Least Concern.

Haplopteris ensiformis (Sw.) E.H. Crane, Syst. Bot. 22(3): 514. 1998.

BEL: Labi, Sg Rampayoh, *Sands MS6002*; Melilas, Kpg Melilas, *Forman LLF1208*; Labi, Bkt Teraja, *Johns RJ6839*; Melilas, Sg Mutip, *Sands MS5972*; Melilas, Ulu Ingei, *Sands MS5898*; Arboretum Sg Liang, *Edwards 511*; Kpg Rambai, Lamunin, *Edwards 475*; Sg Dolhakim, *Edwards 570*; Jln Tanah Jambu, Jln Muara, *Edwards 424*; Sg Dolhakim, *Edwards 569*; Arboretum Sg Liang, *Edwards 492*. **BRM**: Jln Muara, *Edwards 553*; Kerangas, Muara on coast road, *Edwards 789*. **TEM**: Amo, K Belalong, *Ashton A60*; Amo, Batu Apoi FR (K Belalong FSC), *Poulsen ADP84*; Amo, Bkt Belalong, *Sands MS5552*; Amo, Sg Temburong, *Johns RJ7347*; Amo, Sg Temburong, *Johns RJ6928*; Amo, Sg Temburong, *Johns RJ7251*; Amo, Ulu Belalong, *Idris et al. BRUN16667*; Labu, Peradayan FR, *Ariffin et al. BRUN19909*; Amo, G Pagon LP 61, *Liaw 3*; Bkt Patoi, *Edwards 874*; Amo, Kpg Batang Duri, *Edwards 2035*; Amo, Belalong, FSC, *Cicuzza 2507*; Kpg Bakok, *Cicuzza 2706*. **TUT**: Lamunin, Ladan Hills FR, *Johns RJ7116*; Lamunin, Kpg Lamunin, *Edwards 961*. Lamunin, Ladan Hills FR, *Johns RJ7102*; Rambai, Ulu Tutong, *Johns RJ7531*; Rambai, Ulu Tutong, *Johns RJ7573*; Lamunin, Ladan Hills FR, *Wong WKM1650*.

Distribution. Old World tropics.

Ecology. A common epiphyte in lowland primary and secondary forests and plantations; near sea level to 1000 m a.s.l. Threat: Least Concern.

Haplopteris flexuosa (Fée) E.H.Crane, Syst. Bot. 22(3): 514. 1998.

BEL: Wasai Wong Kadir, *Cicuzza 2581*.

Distribution. India, China, Korea, Japan, Indochina, Malay Peninsula, Brunei.

Ecology. Epiphytic on tree trunks along rivers and in mature humid forests. Threat: Rare in Brunei.

Haplopteris hirta (Fée) S.Linds., Gard. Bull. Singapore 62(1): 119. 2010.

TEM: Amo, Kpg Batang Duri, *Edwards 2036*.

Distribution. Malay Peninsula, Borneo (Brunei, Sabah, Sarawak).

Ecology. Epiphytic on tree trunks in lowland forest up to 300 m a.s.l. Threat: Rare in Brunei.

Haplopteris longicoma (Christ) E.H.Crane, Syst. Bot. 22(3): 514. 1998.

TEM: Amo, Sg Temburong, *Johns RJ7147*; Batu Apoi, Bkt Gelagas (Bkt Suang), *Simpson 2410*; Labu, Bkt Patoi (Peradayan FR), *Dransfield SD972*. **TUT**: Rambai, Tasek Merimbun, *Wong WKM593*; Rambai, Ulu Tutong, *Johns RJ7527*.

Distribution. Endemic to Borneo (Brunei, Kalimantan, Sabah, Sarawak).

Ecology. Epiphytic on tree trunks in humid forest sites, c. 700 m a.s.l. Threat: Rare in Brunei.

Haplopteris palustris C.W.Chen, S.Linds. & Cicuzza, Syst. Bot. 49(1): 227–235. 2024. (Fig. 53).

BEL: Badas, Sg Ayam Ayam, *Edwards 680*; Seria, PSF behind Seria, *Edwards 913*; Badas, PSF, *Cicuzza 3026*, *Cicuzza 3101*, *Cicuzza 3102*.

Distribution. Malaysia (Johor, Sarawak), Brunei.

Figure 53. Pteridaceae. *Haplopteris palustris* (Photo D. Cicuzza).

Ecology. This terrestrial species occurs only in peat swamp forests or in the humid aspects of heath forests in Brunei. Threat: Least Concern.

Haplopteris scolopendrina (Bory) C.Presl, Tent. Pterid. 141, pl. 5, f. 21. 1836.

BEL: Labi, Sg Patai, *Ariffin et al. BRUN20446*; Labi, Kpg Tenajor, *Ariffin et al. BRUN16415*. **TEM**: Amo, Sg Temburong, *Johns RJ7235*; Amo, Batu Apoi FR (K Belalong FSC), *Edwards 2030*; between Kpg Batang Duri & K Belalong, *Edwards 2037*; Labu, Peradayan FR, *Ariffin et al. BRUN19911*. **TUT**: Rambai, Sg Medit, *Simpson 2539*, *Simpson 2559*; Rambai, Sg Tutong (Belabau), *Coode MC6336*.

Distribution. West Indian Ocean Islands, Sri Lanka, Thailand, throughout Malesia, to the Pacific Islands.

Ecology. Epiphyte in primary forests to 200 m a.s.l. Threat: Least Concern.

Haplopteris sessilifrons (Miyam. & H.Ohba) S.Linds, Gard. Bull. Singapore 66(2): 171. 2014.

BEL: Melilas, Sg Ingei, *Edwards 2357*; Labi, Sg Gelugos or Wasai Wong Kadir, *Edwards 2561*. **TEM**: Bkt Patoi, *Edwards 873*.

Distribution. Malaysia (Malay Peninsula, Sarawak), Brunei, Indonesia (Kalimantan).

Ecology. In mature lowland forests, along streams and humid sites. Threat: Least Concern.

28.6. Mickelopteris Fraser-Jenk., Annot. Checkl. Ind. Pterid. 1: 246. 2016.

Mickelopteris cordata (Roxb. ex Hook. & Grev.) Fraser-Jenk., Annot. Checkl. Ind. Pterid. 1: 247. 2016.

(=) *Parahemionitis arifolia* (Burm.f.) Panigrahi, Indian Fern J. 9: 244. 1992 publ. 1993.

(≡) *Parahemionitis cordata* (Roxb. ex Hook. & Grev.) Fraser-Jenk., New Sp. Syndr. Indian Pteridol. 187. 1997.

TEM: Amo, Bkt Retak, *Wong WKM897*.

Distribution. Sri Lanka, India, China, Indochina, Brunei, Malay Peninsula, Java, Lesser Sunda Islands, Philippines.

Ecology. Terrestrial in rocky ravines, usually on limestone in lowland forests. Threat: Rare in Brunei.

28.7. Pityrogramma Link, Handbuch 3: 19. 1833.

Pityrogramma calomelanos (L.) Link, Handb. Gewachse 3: 20. 1833.

BEL: Bkt Sawat, Luagan Lalak FRP, *Forman LLF855*; K Belait, Kpg K Balai, *Ariffin ARK78*. **BRM**: Kumbang Pasang, Jln Kumbang Pasang, *Johns RJ7066*. **TEM**: Amo, Sg Temburong, *Wong WKM1747*, *Johns RJ7459*; Amo, Batu Apoi FR (K Belalong FSC), *Edwards 2171*. **TUT**: Lamunin, Ladan Hills FR, *Johns RJ7089*.

Distribution. Originally from tropical and subtropical America; now distributed in many tropical countries.

Ecology. Terrestrial, preferring open sites and disturbed areas along drainages or wet forest habitats; sea level to 3000 m a.s.l. Threat: Least Concern.

28.8. Pteris L., Sp. Pl.: 1073. 1753

Pteris hovenkampii Y.S.Chao, Syst. Bot. 46(3): 746. 2021.

BEL: Kpg Terawan, *van Niel 3514* (L [3599738]).

Distribution. Endemic to Borneo (Brunei, Sabah, Sarawak).

Ecology. In evergreen forests, along paths or riversides below 500 m a.s.l. The species is only known from three localities, viz., Sabah, Sarawak (Mulu) and Brunei. Threat: Rare in Brunei.

Pteris ligulata Gaudich., Voy. Uranie: 385. 1829.

(=) *Pteris furcans* Baker., J. Bot. 26: 324. 1888.

TEM: Amo, Sg Temburong, *Johns RJ7416*, *Edwards 500*, *Edwards 2162*; Sg Belalong, *Edwards 2107*; Amo, K Belalong, *Johns RJ7022*; Batu Apoi, Selapon (Bkt Beliton), *Wong WKM2016*.

Distribution. Borneo (Brunei, Sabah), Sumatra, Sulawesi, Maluku, New Guinea, the Solomon Islands, and the Caroline Islands.

Ecology. Disturbed sites along roads and plantations in the lowlands. Threat: Least Concern.

Pteris quadriaurita Retz., Observ. Bot. 6: 38. 1791.

TUT: Rambai, Sg Tutong (Belabau), *Coode MC6374*.

Distribution. America, Africa and Asia.

Ecology. In open sites, at forest edges or in secondary forests or plantations; sea level to 500 m a.s.l. Threat: Least Concern.

Pteris semipinnata L., Sp. Pl. 2: 1076. 1753.

TEM: Bkt Biang, *Ashton A173*.

Distribution. China, Korea, Japan, Indochina, throughout Malesia; naturalised in Australia.

Ecology. Lowland forests. Threat: Rare in Brunei.

Pteris tripartita Sw., J. Bot. (Schrader) 1800(2). 67. 1801.

BEL: Seria, Badas SL, *Ashton A152*. **BRM**: Jln Muara, *Edwards 543*; Jln Tasek, *Edwards 784*. **TEM**: Amo, Batu Apoi FR (K Belalong FSC), *Edwards 2169*; Bangar town, *Edwards 865*.

Distribution. Old World tropics, widely naturalised in the New World.

Ecology. In open habitats, plantations with humid soil; lowlands below 300 m a.s.l. Threat: Least Concern.

Pteris vittata L., Sp. Pl. 2: 1074. 1753.

BRM: Jln Residency, *Edwards 418*.

Distribution. Old World tropics and temperate regions; widely naturalised in the New World.

Ecology. In disturbed sites, urban areas, and parks. Threat: Least Concern.

28.9. Syngramma J.Sm., London J. Bot. 4: 168. 1845.

Syngramma alismifolia (C.Presl) J.Sm., London J. Bot. 4: 168, t. 7-8, f B. 1845.

BEL: Labi, Sg Teraja, *Edwards 767*; Labi, Bkt Teraja, *Ariffin et al. BRUN20770*; Labi, Bkt Teraja, *Johns RJ6835*; Labi, Kpg Teraja, *Wong WKM989*; Labi, Kpg Teraja, *Ariffin et al. BRUN232333*; Labi, Bkt Teraja, *Johns RJ6846*; Labi, Labi Hills FR, *Idris et al. BRUN18758*; Melilas, Sg Ingei, *Suhaili SZ7*; Melilas, Ulu Ingei, *Dransfield SD953*; Seria, Pekan Seria, *Edwards 911*; Sukang, Kpg Buau, *Idris et al. BRUN18621*; Melilas, Sg Ingei, *Atkins 578*; Labi, Andulau, *Cicuzza 2556*. **BRM**: Sg Akar, *Edwards 513*; Sg Ayam Ayam, *Edwards 678*; Jln Kota Batu, *Edwards 648*. **TEM**: Amo, Bkt Retak, *Johns RJ6603*; Amo, Ulu Temburong (Wong Nguan), *Hussain s.n.*; Amo, Bkt Lutut LP297, *Ariffin et al. BRUN20788*; Amo, Batu Apoi FR (K Belalong FSC), *Poulsen ADP338*; Amo, Sg Temburong, *Johns RJ7238*; Amo, Ulu Belalong, *Idris et al. BRUN16688*; Amo, Batu Apoi FR (K Belalong FSC), *Edwards 2149*; Bangar, Pekan Bangar, *Ashton A78*; Batu Apoi, Bkt Gelagas (Bkt Suang), *Simpson 2228*; Batu Apoi, Bkt Gelagas (Bkt Suang), *Simpson 2379*; Batu Apoi, Kpg Selapon, *Dransfield SD1155*; Labu, Peradayan FR, *Ariffin et al. BRUN19907*; Belalong, FSC, *Edwards 2165*; G Retak, *Johns RJ6613*; Bkt Belalong, *De Vogel 8076*; Bkt Pagon, *Liaw 49*; Belalong, FSC, *Wong WKM3310*; Sg Baki, *Hovenkamp BR006*; Amo, Belalong, FSC, *Cicuzza 2509*. **TUT**: Lamunin, Benutan dam, *Edwards 2242*; Lamunin, Ladan Hills FR, *Coode MC6429*; Lamunin, Ladan Hills FR, *Johns RJ7103*; Lamunin, Ladan Hills FR, *Idris et al. BRUN17656*; Rambai, Bkt Bahak, *Coode MC7094*; Rambai, Ulu Tutong, *Paing s.n.*; Rambai, Sg Medit, *Simpson 2562*; Rambai, Ulu Tutong, *Johns RJ7480*; Sg Ingei, *Edwards 2369*.

Distribution. Malaysia (Malay Peninsula, Sarawak, Sabah), Brunei, Indonesia (Sumatra, Java, Kalimantan, Maluku), Philippines.

Ecology. Terrestrial along streams in primary forest and humid, shady habitats; lowlands to 1000 m a.s.l. Threat: Least Concern.

Syngramma borneensis (Hook.) J.Sm., Hist. Fil. 152. 1875.

BEL: Labi, Bkt Teraja, *Simpson 2045*; Labi, Kpg Labi, *Johns RJ6823*; Labi, Kpg Labi, *Johns RJ6824*; Labi, Bkt Teraja, *Johns RJ6871*; Melilas, Bkt Batu Patam (Ulu Ingei), *Dransfield SD936*; Melilas, Bkt Batu Patam (Ulu Ingei), *Dransfield SD967*; Melilas, Bkt Batu Patam (Ulu Ingei), *Wong WKM1139*; Wasai Wong Kadir, *Edwards 2256*; Bkt Teraja, *Cicuzza 2676*. **BRM**: Kumbang Pasang, Jln Kumbang Pasang, *Johns RJ7069B*; Kumbang Pasang, Jln Kumbang Pasang, *Sands MS5657*. **TEM**: Labu, Bkt Patoi (Peradayan FR), *Ariffin et al. BRUN19903*; Bkt Patoi, *Edwards 2258*; Sg Temburong, *Hovenkamp BR005*. **TUT**: Rambai, Ulu Tutong, *Ashton BRUN5636*.

Distribution. Malaysia (Malay Peninsula, Sarawak, Sabah), Indonesia (Kalimantan, Sulawesi, Maluku, Indonesian New Guinea), Papua New Guinea, and Pacific Islands.

Ecology. Lithophytic, or rarely epiphytic, in shade along cliffs or ridges of lowland forests. Threat: Least Concern.

Syngramma cartilagidens (Baker) Diels, Nat. Pflanzenfam. [Engler & Prantl] 1 (4): 257. 1899.

BEL: Labi, Sg Rampayoh, *Sands MS5995*. **TEM**: Amo, Bkt Retak, *Sands MS5227*.

Distribution. Malaysia (Malay Peninsula, Sarawak, Sabah), Brunei, and Papua New Guinea.

Ecology. Shady and wet rocks along streams between 300–1000 m a.s.l. Threat: Rare in Brunei.

Syngramma lobbiana (Hook.) J.Sm., Hist. Fil. 152. 1875. (Fig. 54).

BEL: Bkt Sawat, *Cicuzza 3031*.

Distribution. Endemic to Borneo.

Ecology. Shaded areas in mature forests, temporarily waterlogged sites, and rocky areas. Threat: Rare in Brunei.

Syngramma wallichii (Hook.) Bedd., Ferns Brit. Ind. 1: t. 153. 1866.

BEL: Melilas, Bkt Batu Patam (Ulu Ingei), *Wong WKM1025*, *Dransfield SD937*; Labi, Kpg Teraja, *Wong WKM988*. **TEM**: Labu, Bkt Patoi (Peradayan FR), *Edwards 868*; Amo, Belalong, KBFSC, *Cicuzza 2717*; Amo, Sg Belalong, *Cicuzza 2733*.

Distribution. Malaysia (Malay Peninsula, Sarawak, Sabah), Brunei, Indonesia (Sumatra, Kalimantan, Sulawesi, Maluku), Philippines.

Ecology. Shady habitats with humid soil in mature forests. Threat: Least Concern.

28.10. Taenitis Willd. ex Schkuhr, Deutschl. Krypt. Gew. 1: 21. 1805.

Taenitis blechnoides (Willd.) Sw., Syn. Fil. (Swartz) 24, 220. 1806. (Fig. 55).

BEL: Melilas, Bkt Batu Patam (Ulu Ingei), *Wong WKM1016*, *Dransfield SD946*; Melilas, Sg Ingei, *Edwards 2353*; Labi, Bkt Teraja, *Johns RJ6840*, *Johns RJ6881A*; Labi, Bkt Telingan, *Dransfield SD1134*; Liang, Andulau FR (Sg Liang), *Ibrahim et al. BRUN19833*, *Ashton A190*; Sg Mendaram, *Ariffin et al. BRUN22792*. **BRM**: Jln Muara, *Edwards 423*; Jln Tg Batu, *Edwards 2306*; Tanah Jambu, proposed estate, *Edwards 2419*; Kpg Dadap, *Edwards 2281*. **TEM**: Amo, Bkt Retak, *Johns RJ6511, Johns RJ6667*; Amo, Ulu Belalong, *Idris et al. BRUN16665*; Amo, Bkt Belalong, *Dransfield SD1224, Edwards 2318*; Bangar, Bkt Biang, *Ashton A97*. G Pagon, *Liaw 36*; Belalong, FSC, *Tagane B583*; Bkt Belalong, *Edwards & Cantley 814*. **TUT**: Rambai, Bkt Tangan, *Suzuki K13078*; Rambai, Kpg Panchong, *Forman LLF996*; Rambai, Ulu Tutong, *Johns RJ7604*; Telisai, Kpg Telamba, *Ariffin et al. BRUN20765*; Sg Layong, *Edwards 471*; Tasek Merimbun, *Edwards 594*; Kago dam, *Cicuzza 2649*.

Distribution. Sri Lanka, India, China, Indochina, throughout Malesia, to Fiji and Micronesia.

Figure 54. Pteridaceae. *Syngramma lobbiana* (Photo D. Cicuzza).

Figure 55. Pteridaceae. *Taenitis blechnoides* (Photo D. Cicuzza).

Ecology. Terrestrial, in forest shade as well as dry sites; common in lowland mixed dipterocarp forest or mature coastal forest. Threat: Least Concern.

Taenitis dimorpha Holttum, Gard. Bull. Singapore 11(4): 274. 1947.

TEM: Amo, Bkt Belalong, *Wong WKM1430*.

Distribution. Malay Peninsula and Borneo (Brunei).

Ecology. Lowland forests. Threat: Rare in Brunei.

Taenitis hookeri (C.Chr.) Holttum, Kew Bull. 30: 334. 1975.

TEM: Amo, Bkt Retak, *Johns RJ6628, Johns RJ6596*.

Distribution. Endemic to Borneo (Brunei, Kalimantan, Sabah, Sarawak).

Ecology. In lowland forest sites. Threat: Rare in Brunei.

Taenitis interrupta Hook. & Grev., Icon. Filic. t. 63. 1828.

BEL: Melilas, Batu Melintang, *Edwards 2344*; Melilas, Bkt Batu Patam (Ulu Ingei), *Dransfield SD959*; Melilas, Sg Ingei, *Wong WKM1103*; K Belait, Sg Belait, *Forman LLF1148*. **BRM**: Kpg Dadap, *Edwards 2278*, *Edwards 2280*. **TEM**: Amo, Bkt Retak, *Wong WKM422*; G Pagon, *Ashton A312*. **TUT**: Rambai, Sg Medit, *Simpson 2572*.

Distribution. Malaysia, Singapore, Brunei, Indonesia (Kalimantan).

Ecology. Confined to wet ground, often in lowland forests. Threat: Least Concern, but occurs at low frequencies in Brunei.

28.11. Vaginularia Fée, Mém. Foug., 3. Hist. Vittar.: 50. 1852.

Vaginularia trichoidea Fée, Mém. Foug., 3. Hist. Vittar.: 34. 1852.

TEM: Amo, Batu Apoi FR (K Belalong FSC), *Edwards 2022*; Sg Belalong, *Edwards 2135*. **TUT**: Lamunin, *Edwards 757*.

Distribution. China, Thailand, Malesia, to the Pacific Islands.

Ecology. Epiphytic in primary forests, often on tree fern trunks; between 500–2000 m a.s.l. Threat: Rare in Brunei.

Family 29. SACCOLOMATACEAE

29.1. Saccoloma Kaulf., Berin Jahrb. Pharm. Verbundenen Wiss. 21: 51. 1820.

Saccoloma kingii (Bedd.) Parris, Pl. Mt. Kinabalu 1: 151. 1992.

TEM: Amo, Bkt Retak, *Wong WKM781*.

Distribution. Sumatra, Malay Peninsula, Borneo (Brunei, Kalimantan, Sabah), Philippines, Maluku, New Guinea.

Ecology. Terrestrial; in montane forests. Threat: Rare in Brunei.
Notes

The taxonomy and nomenclature of this species could be complex and as yet not fully resolved.

Family 30. SCHIZAEACEAE

30.1. Actinostachys Wall., Numer. List.: n°1. 1829.

Actinostachys digitata (L.) Wall. ex Reed, Bol. Soc. Brot. 21: 130. 1947.

(≡) *Schizaea digitata* (L.) Sw., Syn. Fil. (Swartz) 150, 380, t. 4, f. 1. 1806.

BEL: Labi, Bkt Teraja, *Johns RJ6862*; Liang, Andulau FR (Sg Liang), *Edwards 907*; Melilas, Sg Ingei, *Wong WKM649*; Arboretum Sg Liang, *Edwards 509*, *Edwards 483*. **BRM**: Kumbang Pasang, Jln Kumbang Pasang, *Sands MS5658*; UBD campus, *Tan s.n.*; Tasek Gorge, *Edwards 530*; Kpg Dadap, *Edwards 2284*. **TEM**: Amo, K Belalong, *Johns RJ6998*; Amo, Sg Temburong, *Johns RJ7338*; Amo, Batu Apoi FR (K Belalong FSC), *Poulsen ADP360*; Amo, Belalong hilltop, *Cicuzza 2510*; Bukok, Kpg Temada, Temada, *Simpson 89/151*. **TUT**: Telisai, Bkt Beruang, *Forman LLF803*; Telisai, Bkt Beruang, *Forman LLF812*; Telisai, Pasir Puteh, *Johns RJ6771*; Tasek Merimbun, *Edwards 597*; Telisai Pasir Puti, *Cicuzza 2522*.

Distribution. From Madagascar, tropical Asia to China, throughout Malesia, to Australia and Polynesia.

Ecology. Terrestrial in dry and sparse forests with sandy soil; it shares the same habitat as *Schizaea dichotoma* but is less common; near sea level to 1500 m a.s.l. Threat: Least Concern.

Actinostachys wagneri (Selling) Reed, Bol. Soc. Brot. 21: 131. 1947.

(≡) *Schizaea wagneri* Selling, Svensk Bot. Tidskr. 40: 278. 1946.

BRM: Meragang Ridge, *Edwards 2326*.

Distribution. Peninsular Malaysia, Singapore, Brunei, Maluku, New Guinea, Australia, and Solomon Islands.

Ecology. On dry aspects of lowland forests. Threat: Rare in Brunei. Despite a single collection, this species can be easily overlooked, so further studies are needed to confirm its distribution within the country.

30.2. Schizaea Sm., Mém. Acad. Roy. Sci. (Turin) 5: 419. 1793.

Schizaea dichotoma (L.) Sm., Mém. Acad. Roy. Sci. (Turin) 5: 422, t. 9, f. 9. 1793. (Fig. 56).

BEL: Bkt Sawat, Merangking-Buau, *Coode MC7697*; Labi, Kpg Teraja, *Sands MS6018*; Labi, Wasai Wong Kadir (Wasai Rampayoh), *Johns RJ7455*; Labi, Bkt Teraja, *Johns RJ6895*; Liang, Andulau FR (Sg Liang), *Edwards 906*; Melilas, Sg Mutip, *Sands MS5974*; Melilas, Sg Ingei, *Wong WKM644*; Melilas, Sg Ingei, *Edwards 2354*; Sukang, Sg Paleh Bangawong, *Kirkup DK688*; K Belait, Sg Belait, *Dransfield SD1139*; Sg Liang, Arboretum, *Edwards 484*. **BRM**: Berakas, Kpg Tanah Jambu, *Edwards 2420*; Kpg Dadap, *Edwards 547*, *Edwards 2285*; Jln Kota Batu, *Edwards 641*. **TEM**: Amo, K Belalong, *Dransfield SD1031*; Amo, Batu Apoi FR (K Belalong FSC), *Poulsen ADP127*; Batu Apoi, Bkt Gelagas (Bkt Suang), *Simpson 2310*; Sg Temburong, *Edwards 627*; Amo, Belalong, hilltop, *Cicuzza 2516*. **TUT**: Tg Maya, Kpg Bkt Udal, *Voeks RV554*; Tg Maya, Jln Tutong-Belait (Pasir Puteh), *Paing BRUN15105*; Tg Maya, Jln Tutong-Belait (Pasir Puteh), *Idris et al. BRUN15855*; Rambai, Kpg Panchong, *Forman LLF993*; Rambai, Tasek Merimbun, *Bernstein JHB11*; Rambai, Sg Medit, *Simpson 2534*; Rambai, Tasek Merimbun, *Suzuki K13090*; Telisai, Pasir Puteh, *Johns RJ6770*; Tasek Merimbun, *Edwards 598*; Telisai Pasir Puti, *Cicuzza 2523*, *Cicuzza 2536*, *Cicuzza 2537*.

Figure 56. Schizaeaceae. *Schizaea dichotoma* (Photo KM. Wong).

Distribution. Old World tropics.

Ecology. Terrestrial in dry forests with sandy soil, also in drier areas on hilltops; found throughout the lowlands to 2000 m a.s.l. Threat: Least Concern.

Schizaea malaccana Baker, Syn. Fil. (Hooker & Baker) 428. 1868.

TEM: Amo, Bkt Retak, *Johns RJ6662*, *Johns RJ6580*, *Edwards 860*, *Sands MS5222*.

Distribution. Malaysia (Malay Peninsula, Sarawak, Sabah), Brunei, Philippines, New Guinea, the Solomon Islands, and Australia.

Ecology. In dry, sparse forests with poor sandy soil, often on mountaintops; lowland forests up to 1200(–1500) m a.s.l. Threat: Rare in Brunei.

Family 31. TECTARIACEAE

31.1. Draconopteris Li Bing Zhang & Liang Zhang, Taxon 65: 732. 2016.

Draconopteris grandidentata (Ces.) Christenh., Global Fl. 4: 40. 2018.

BEL: Labi, Wasai Teraja, *Sands MS5684*; Labi, Sg Mendaram, *Johns RJ6826*; Rampayoh Timur, *Ariffin et al. BRUN24487*. **TEM**: Amo, Sg Temburong, *Johns RJ7296*; Batu Apoi, *Edwards 2450*; Amo, Sg Temburong, *Cicuzza 2585*; Amo, Sg Belalong, *Cicuzza 2638*. **TUT**: Rambai, Ulu Tutong, *Johns RJ7484*; Benutan Lake, *Edwards 2238*; Sg Apan, *Edwards 2202*.

Distribution. Malaysia (Malay Peninsula, Sarawak, Sabah), Brunei, Indonesia (Sumatra, Kalimantan).

Ecology. An obligate lithophyte that occurs only on rocks or cliffs close to streams in mature lowland tropical forest. Threat: Least Concern; however, population density in Brunei is low.

31.2. Polydictyum C.Presl, Abh. König. Böhm. Ges. Wiss., ser. 5,6: 52. 1851.

Polydictyum ternatum (Baker) S.Y.Dong & C.W.Chen, J. Syst. Evol. 56: 146. 2017.

BEL: Labi, Sg Rampayoh, *Coode MC7262*; Labi, Bkt Teraja, *Johns RJ6902*; Labi, Sg Mendaram, *Johns RJ6818*; Melilas, Bkt Batu Patam (Ulu Ingei), *Wong WKM1031*; Sg Teraja, *Edwards 682*,

Edwards 2532; Wasai Wong Kadir, *Edwards 2550*; Ulu Sg Malayan, *Ariffin et al. BRUN23290*; Wasai Wong Kadir, *Cicuzza 2590*. **BRM**: Pipeline Wasan, *Edwards 982*. **TEM**: Amo, Ulu Belalong, *Idris et al. BRUN16686*; Amo, Sg Sibut, *Johns RJ6920*; Amo, Sg Sibut, *Johns RJ6915*; Amo, Sg Temburong, *Coode MC6688*; Amo, Bkt Belalong, *Dransfield SD1258*; Amo, Batu Apoi FR (K Belalong FSC), *Poulsen ADP112*; Amo, Bkt Belalong, *Wong WKM1460*; Amo, Bkt Lutut LP297, *Ariffin et al. BRUN20815*; Bangar, Pekan Bangar, *Ashton A84*; Bangar, Bkt Biang, *Forman LLF923*; Batu Apoi, Bkt Gelagas (Bkt Suang), *Simpson 2197*; Batu Apoi, Bkt Gelagas (Bkt Suang), *Simpson 2360*; Batu Apoi, Sg Apan, *Idris et al. BRUN15287*; Labu, Peradayan FR, *Johns RJ7062*; Labu, Peradayan FR, *Ariffin et al. BRUN19900*; Labu, Bkt Patoi (Peradayan FR), *Edwards 886*; Sg Baki, *Edwards 2178;* Batu Apoi, *Edwards 2451*; Batu Apoi, *Samhan SN6*; Sg Belalong, *Edwards 2176*; Kpg Lamaling, *Cicuzza 2660*. **TUT**: Lamunin, Ladan Hills FR, *Joffre et al. BRUN18139*; Lamunin, Benutan dam, *Edwards 2232*, *Edwards 746*.

Distribution. Endemic to Borneo (Brunei, Kalimantan, Sarawak).

Ecology. Lowland forests below 300 m a.s.l.; usually in humid habitats near rocky streams. Threat: Least Concern.

31.3. **Tectaria** Cav., Anales Hist. Nat. 1: 115. 1799.

Tectaria angulata (Willd.) Copel., Sarawak Mus. J. 2: 370. 1917. (Fig. 57).

BEL: Labi, Wasai Wong Kadir, *Johns RJ7447*; Wasai Wong Kadir, *Edwards 2571*; Wasai Wong Kadir, *Cicuzza 2587*; Labi, Sg Teraja, *Edwards 798*; Labi, Bkt Teraja; *Simpson 2089*; Labi, Sg Mendaram, *Johns RJ6819*; Sg Teraja, *Edwards 686*; Wasai Wong Kadir, *Cicuzza 2594*; Bkt Teraja, *Ariffin et al. BRUN232425*. **TEM**: Amo, Sg Temburong, *Johns RJ7142*; Amo, Batu Apoi FR (K Belalong FSC), *Edwards 2021*; Batu Apoi, *Samhan SN12*; Amo, Batu Apoi FR (K Belalong FSC), *Poulsen ADP163*; Amo, Sg Temburong, *Johns RJ7128*; Amo, Sg Sibut, *Johns RJ6919;* Amo, Bkt Retak, *Johns RJ6695*; Batu Apoi, Bkt Gelagas (Bkt Suang), *Simpson 2434*; Bangar, Bkt Biang, *Forman LLF919*; Labu, Bkt Patoi (Peradayan FR), *Edwards 898*; Labu, Peradayan FR, *Johns RJ7063*; Labu, Peradayan FR, *Johns RJ7053*; Sg Belalong, *Edwards 2175*; Amo, Belalong, FSC, *Cicuzza 2511*. **TUT**: Lamunin, Benutan dam, *Edwards 2241*; Sg Teraja, *Edwards 2529*; Benutan dam, *Ariffin et al. BRUN24288*.

Distribution. Thailand, throughout Malesia, and the Solomon Islands.

Ecology. Along streams in primary forest, and in sites with boulders. Threat: Least Concern.

Tectaria barberi (Hook.) Copel., Philipp. J. Sci., C 2: 414. 1907. (Fig. 58).

BEL: Labi, Kpg Teraja, *Ariffin et al. BRUN21738*; Melilas, Batu Melintang, *Kessler PK392*; Sg Teraja, *Edwards D2538*; Sg Liang, *Edwards 493*; Belait Sukang, *Lee 933*. **BRM**: Pengkalan Batu, Kpg Wasan, *Edwards 971*; Jln Kota Batu, *Edwards 644*; Jln Sg Akar, *Edwards 514*; Tanah Jambu, *Edwards 2421*; Tasek Gorge, *Edwards 526*; Kpg Dadap, *Edwards 2286*. **TEM**: Amo, Batu Apoi FR (K Belalong FSC), *Poulsen ADP125*; Labu, Peradayan FR, *Ariffin et al. BRUN19915*; Bangar, Pekan Bangar, *Ashton A88*; Bangar, Pekan Bangar; *Ashton A81*; Bkt Patoi, *Edwards 2249*; Kpg Bakok, *Cicuzza 2708*; Amo, Belalong, KBFSC, *Cicuzza 2725*. **TUT**: Lamunin, Ladan Hills FR, *Johns RJ7112*; Lamunin, Ladan Hills FR, *Johns RJ7118*; Rambai, Tasek Merimbun, *Johns RJ7469*; Benutan reservoir, *Edwards 932*; Benutan lake, *Edwards 2220*, *Edwards 2228*, *Edwards D2229*; Kago dam, *Cicuzza 2652*.

Figure 57. Tectariaceae. *Tectaria angulata* (Photo D. Cicuzza).

Distribution. Indochina, Malaysia (Malay Peninsula, Sarawak, Sabah), Brunei, Indonesia (Sumatra, Kalimantan), and the Philippines.

Ecology. Lowlands, along rivers and humid habitats in pristine forests. Threat: Least Concern.

Tectaria crenata Cav., Descr. Pl. 250. 1802.

(=) *Aspidium tectaria* Desv. Mém. Soc. Linn. Paris 6: 254. 1827.

BEL: Wasai Telingan, *Cicuzza 3038*. **TEM**: Amo, Ulu Belalong, *Idris et al. BRUN16699*.

Distribution. Indochina, throughout Malesia, to Micronesia and Polynesia.

Figure 58. Tectariaceae. *Tectaria barberi* (Photo D. Cicuzza).

TEM: Amo, Sg Temburong, *Coode MC6689*; Amo, Bkt Retak, *Johns RJ6710*; Amo, Sg Temburong, *Johns RJ7374*; Amo, Batu Apoi FR (K Belalong FSC), *Poulsen ADP354*.

Distribution. Endemic to Borneo (Brunei, Sabah, Sarawak).

Ecology. In pristine forests with mature and humid soil, and along streams. Threat: Rare in Brunei.

Tectaria jacobsii Holttum, Blumea 35(2): 552. 1991.

TEM: Sg Enkiang, *Edwards 2047*; Sg Belalong, *Edwards 2109*; Sg Esu, *Edwards 2121*; Sg Belalong, *Hovenkamp BR018*.

Distribution. Endemic to Brunei.

Ecology. In pristine lowland forests. Threat: Rare in Brunei.

Tectaria johannis-winkleri (C.Chr.) C.Chr., Index Filic., Suppl. 3, 180. 1934.

TEM: Amo, Bkt Retak, *Johns RJ6598*, *Johns RJ6705*.

Distribution. Endemic to Borneo (Brunei, Kalimantan).

Ecology. Hilly sites in mature hill forest, c. 650 m a.s.l. Threat: Rare in Brunei.

Tectaria lobbii (Hook.) Copel, Philipp. J Sci. 10: 146. 1915.

(=) *Tectaria hosei* (Baker) Copel., Sarawak Mus. J. 2: 371. 1917.

TEM: Batu Apoi, *Samhan SN5*; Amo, Sg Belalong (Amo), *Middleton DJM754*; Amo, Sg Temburong, *Idris et al. BRUN15609*; Amo, K Belalong, *Johns RJ6985*; Amo, Sg Temburong, *Johns RJ7122*; Amo, Batu Apoi FR, *Poulsen ADP299*; Sg Sitam, *Edwards 2014*; Sg Belalong, *Edwards 962*; Sg Enkiang, *Edwards 2058*; Sg Temburong, *Edwards 2213A*; Sg Belalong, *Ashton A113*; Amo, Batu Apoi FR (K Belalong FSC), *Edwards 2058*; Amo, Batu Apoi FR (K Belalong FSC), *Edwards 2014*; Amo, Batu Apoi FR (K Belalong FSC), *Edwards 962*; Amo, Sg Temburong, *Sands MS5563*; Amo, Sg Belalong (Amo), *Wong WKM1330*; Amo, Sg Temburong, *Coode MC6626*; Amo Belalong, FSC, *Cicuzza 2512*.

Distribution. Borneo (Brunei, Kalimantan, Sarawak), Philippines, and Maluku.

Ecology. Terrestrial or lithophytic along streams and humid sites in lowland forest. Threat: Least Concern.

Tectaria pleiosora (Alderw.) C.Chr., Gard. Bull. Straits Settlem. 7: 260. 1934.

TEM: Amo, Bkt Belalong, *Dransfield SD1240*; Amo, Batu Apoi FR, *Sands MS5850*; KBFSC, Rhizanthes plot, *Edwards 2291*.

Distribution. Borneo (Brunei, Kalimantan, Sabah, Sarawak), Sulawesi, Maluku, Indonesian New Guinea, Papua New Guinea.

Ecology. Shady habitats in mature forests between 500–900 m a.s.l. Threat: Rare in Brunei.

Tectaria profereoides (Christ.) S.Y.Dong, Phytotaxa 178: 226. 2014.

TEM: Batu Apoi, Sg Temburong (Batu Apoi), *Sands MS5816*.

Distribution. Malaysia (Sabah, Sarawak), Brunei, Philippines, Indonesia (Indonesian New Guinea), Papua New Guinea.

Ecology. Shady habitats with humid soil in pristine forests. Threat: Least Concern.

Tectaria singaporeana (Hook. & Grev.) Copel., Sarawak Mus. J. 2: 368. 1917.

TEM: Labu, Bkt Patoi (Peradayan FR), *Edwards 870*.

Distribution. Thailand, Malay Peninsula, Sumatra, Borneo (Brunei, Kalimantan), and Maluku.

Ecology. Shady and humid sites in lowland forests, often lithophytic on rocks and boulders. Threat: Least Concern.

Notes

This species is poorly collected in Borneo, and presumably often confused with the more common species *Polydictyum ternatum*. This species often has juvenile leaves with a single pinna, but always sterile. Moreover, the sori arrangement and density between the two species is rather different, with *T. singaporeana* having denser sori density.

Tectaria tricuspis (Bedd.) Copel., Sarawak Mus. J. 2: 369. 1917.

BEL: Melilas, Ulu Ingei, *Sands MS5920*. **TEM**: Amo, Batu Apoi FR (K Belalong FSC), *Hansen CH1523*. **TUT**: Lamunin, Kpg Lamunin, *Ariffin ARK100*.

Distribution. Malay Peninsula, Borneo (Brunei, Kalimantan, Sarawak).

Ecology. Lowland forests, in rocky sites. Threat: Least Concern.

Tectaria vasta (Blume) Copel., Philipp. J. Sci., C 2: 411. 1907.

BEL: Bkt Sawat, Ulu Sg Singap, *Hairun BRUN22218*; Labi, Labi Hills FR, *Ariffin et al. BRUN22570*; Labi, Labi Hills FR, *Ariffin et al. BRUN21448*. **TEM**: Amo, Batu Apoi FR (K Belalong FSC); *Edwards 988*; Amo, K Belalong FSC, *Schatz GS3274*; Amo, Batu Apoi FR (K Belalong FSC), *Poulsen ADP138*; Amo, Batu Apoi FR (K Belalong FSC), *Edwards 2053*; Amo, K Belalong, *Dransfield 1032*; Amo, Batu Apoi FR (K Belalong FSC), *Middleton DJM790*; Amo, Bkt Belalong, *Sands MS5548*; Batu Apoi, Selapon (Bkt Beliton), *Wong WKM2068*.

Distribution. India, China, Indochina, through Malesia.

Ecology. Along streams with large boulders (granite) in mature lowland forests. Threat: Least Concern.

Family 32. THELYPTERIDACEAE

32.1. Abacopteris Fée, Mém. Foug., 5. Gen. Filic.: 309. 1852.

Abacopteris nitida (Holttum) S.E.Fawc. & A.R.Sm. ex Kovalchuk, Phytotaxa 619(2): 203. 2023 (Fig. 59).

BEL: Bkt Sawat, Kpg Merangking, *Ariffin et al. BRUN21988*; Melilas, Kpg Melilas, *Forman LLF1212*; Sg Teraja, *Edwards 2524*. **BRM**: Sg Subok, *Edwards 413*; Sg Tilong, *Edwards 545*. **TEM**: Amo, Sg Belalong (Amo), *Johns RJ7032*; Amo, K Belalong, *Johns RJ6949*; Amo, K Belalong, *Johns RJ6956*; Amo, K Belalong FSC, *Poulsen ADP129*; Bangar, Jln Temada, *Forman LLF938*; Bangar, Bkt Biang, *Ashton A96*; Batu Apoi, Kpg Selapon, *Idris et al. BRUN19559*; Labu, Bkt Patoi (Peradayan FR), *Edwards 2251*; Sg Enkiang, *Edwards 2057*; Bangar, *Edwards 497*. **TUT**: Rambai, Kpg Benutan, *Ariffin ARK58*; Rambai, Tasek Merimbun, *Bernstein JHB226*; Rambai, Tasek Merimbun, *Bernstein JHB511*; Rambai, Tasek Merimbun, *Suzuki K13315*.

Figure 59. Thelypteridaceae. *Abacopteris nitida* (Photo D. Cicuzza).

Distribution. Brunei, Malaysia (Malay Peninsula, Sarawak, Sabah), Indonesia (Kalimantan, Sulawesi), Philippines.

Ecology. In primary and secondary forests along streams with thick, humid soil. Threat: Least Concern.

32.2. Amblovenatum J.P.Roux, Strelitzia 23: 200. 2009.

Amblovenatum immersum (Blume) Mazumdar, Int. J. Adv. Res. Innov. Ideas Educ. 3(2): 5060. 2017. (Fig. 60).

BRM: Wasan Pipeline, *Edwards 976*. **TEM**: Amo, K Belalong FSC, *Edwards 2217*. **TUT**: Lamunin, Benutan dam, *Edwards 2426*; Lamunin, Benutan dam, *Edwards 928*.

Distribution. India, China, Thailand, throughout Malesia, to Australia, and the Pacific Islands.

Ecology. Common on limestone and along streams in forests; lowlands below 500 m a.s.l. Threat: Least Concern.

Amblovenatum opulentum (Kaulf.) J.P.Roux, Strelitzia 23: 201. 2009.

TEM: Amo, Bkt Retak, *Wong WKM850*. **TUT**: Lamunin, Benutan dam, *Edwards 2334*.

Figure 60. Thelypteridaceae. *Amblovenatum immersum* (Photo D. Cicuzza).

Distribution. Old World tropics; naturalised in tropical America.

Ecology. Sparse forests, secondary forests, and swampy forests in the lowlands. Threat: Rare in Brunei.

32.3. Chingia Holttum, Blumea 19: 31. 1971.

Chingia clavipilosa Holttum, Kalikasan 3: 23. 1974.

TEM: Bkt Belalong, *Samhan SN3*.

Distribution. Java, Borneo (Brunei, Sarawak), and the Philippines.

Ecology. In mature forests. Threat: Rare in Brunei

32.4. Christella H.Lév., Fl. Kouy-Tchéou: 472. 1915.

Christella dentata (Forssk.) Brownsey & Jermy, Brit. Fern Gaz. 10: 338. 1973.

TUT: Tasek Merimbun, *Edwards 593*.

Distribution. Old World tropics; widely naturalised in the New World.

Ecology. Close to bodies of freshwater in forests. Threat: Rare in Brunei.

Christella subpubescens (Blume) Holttum, Webbia 30(1): 193. 1976.

TEM: Bangar, *Edwards 499*.

Distribution. India, Sri Lanka, China, Japan, Indochina, throughout Malesia, to Australia and the Pacific Islands.

Ecology. In disturbed sites, urban areas, and parks. Threat: Least Concern.

32.5. Coryphopteris Holttum, Blumea 19: 33. 1971

Coryphopteris viscosa (Baker) Holttum var. ***viscosa***, Blumea 19: 33. 1971.

TEM: Amo, G Pagon, *Edwards 847*.

Distribution. Malaysia (Malay Peninsula, Sarawak), Brunei.

Ecology. In montane forests. Threat: Rare in Brunei.

Coryphopteris viscosa (Baker) Holttum var. ***borneensis*** Holttum, Blumea 23(1): 29. 1976.

TEM: Amo, G Pagon, *Ariffin ARK133*; Amo, G Pagon, *Coode MC7508*; Amo, G Pagon, *Coode MC6551*; Amo, G Pagon, *Wong WKM1792*.

Distribution. Endemic to Borneo (Brunei, Kalimantan, Sarawak).
Ecology. The few collections were from mature montane forest on rich and humid soil near ridges above 2000 m a.s.l. Threat: Rare in Brunei.

32.6. Cyclosorus Link, Hort. Berol. 2: 128. 1833.

Cyclosorus interruptus (Willd.) H.Itô, Bot Mag. (Tokyo) 51: 714, f. 9. (1937).

BEL: Sg Teraja, *Edwards 2543*. **BRM**: Jln Mulaut, *Edwards 406*. **TEM**: Amo, G Pagon, *Coode 7508*; Amo, Bkt Retak, *Johns RJ6551*; Amo, G Pagon, *Wong WKM1792*. **TUT**: Lamunin, Benutan dam, *Edwards 2222*; Lamunin, Benutan dam, *Edwards 927*; Ukong, Kpg Ukong, *Niga NN176*.

Distribution. Pantropical.

Ecology. In forests along rivers, and in secondary forests and plantations. Threat: Least Concern.

32.7. Grypothrix (Holttum) S.E.Fawc. & A.R.Sm., Sida, Bot. Misc. 59: 46. 2021.

Grypothrix cuspidata (Blume) S.E.Fawc. & A.R.Sm., Sida, Bot. Misc. 59: 47. 2021.

TEM: Amo, Bkt Belalong, *Poulsen ADP352*. **TUT**: Lamunin, Ladan Hills FR, *Johns RJ7088*; Lamunin, Ladan Hills FR, *Johns RJ7119*.
Distribution. China, Vietnam, Taiwan, Malaysia (Sabah), Brunei, Indonesia (Sumatra, Java, Lesser Sunda Islands, Kalimantan, Maluku) and the Pacific Islands.

Ecology. Terrestrial or lithophytic (on rocks or steep valley-sides) in forests or along streams; lowlands to c. 1200 m a.s.l. Threat: Rare in Brunei.

Grypothrix salicifolia (Wall. ex Hook.) S.E.Fawc. & A.R.Sm., Sida, Bot. Misc. 59: 47. 2021.

TEM: Amo, Sg Belalong (Amo), *Edwards 2118*.

Distribution. Thailand, Malaysia (Malay Peninsula, Sarawak, Sabah), Indonesia (Sumatra, Kalimantan), Brunei.

Ecology. Terrestrial or lithophyte in swampy areas or along streams in lowland forest. Threat: Rare in Brunei.

Grypothrix triphylla (Sw.) S.E.Fawc. & A.R.Sm., Sida, Bot. Misc. 59: 48. 2021.

TUT: Rambai, Kpg Panchong, *Forman LLF1002*; Sg Padang, Merimbun, *Edwards 657*.

Distribution. India, Sri Lanka, China, Taiwan, Japan, Indochina, Malaysia (Malay Peninsula), Brunei, Indonesia (Sumatra, Java, Lesser Sunda Islands, Kalimantan), Philippines, New Guinea, Australia, Fiji.

Ecology. In secondary forests or plantations, around villages; lowlands up to 500 m a.s.l. Threat: Rare in Brunei.

32.8. Macrothelypteris (H.Itô) Ching, Acta Phytotax. Sin. 8: 308. 1963

Macrothelypteris torresiana (Gaudich.) Ching, Acta Phytotax. Sin. 8(4): 310. 1963.

BRM: Gadong, Tunku-Gadong Highway, *Edwards 2424*.

Distribution. Old World tropics; widely naturalised in the New World.

Ecology. In sparse forest, particularly in areas with dry spells; lowlands to 1500 m a.s.l. Threat: Least Concern.

32.9. Mesophlebion Holttum, Blumea19: 29. 1971

Mesophlebion beccarianum (Ces.) Holttum, Blumea 22(2): 230. 1975.

BEL: Sukang, Buau-Sindum, *Idris et al. BRUN18623*. **TEM**: Amo, Ulu Belalong, *Idris et al. BRUN16698*; Amo, Ulu Belalong, *Idris et al. BRUN15893*; Amo, Bkt Belalong, *Wong WKM1355*; Amo, Sg Temburong, *Wong WKM482*; Amo, K Belalong, *Ashton A355*; Amo, Sg Temburong, *Johns RJ7345*; Amo, Bkt Belalong, *Dransfield SD1217*; Amo, Bkt Belalong, *Poulsen ADP92*; Amo, K Belalong FSC, *Schatz GS3308*; Amo, Bkt Belalong, *Edwards 2312*, *Edwards & Cantley 809*; Bkt Belalong, *Samhan SN5*.
Distribution. Malaysia (Malay Peninsula, Sarawak), Brunei, Indonesia (Sumatra, Kalimantan, Indonesian New Guinea), Papua New Guinea.

Ecology. In forests with dry and well-drained soil between 200–1200 m a.s.l. Threat: Least Concern.

Mesophlebion crassifolium (Blume) Holttum, Blumea 22(2): 232. 1975.

(=) *Mesophlebion chlamydophorum* (Rosenst. ex C.Chr.) Holttum, Blumea 22(2): 231. 1975.

BEL: Melilas, Sg Ingei, *Edwards 2351*; Melilas, Batu Melintang, *Edwards 2346*. **TEM**: Amo, Bkt Pagon, *Wong WKM1776*. **TUT**: Rambai, Sg Medit, *Simpson 2519*; Ukong, Kpg Talad-Bang Pangan, *Ariffin et al. BRUN20454*.

Distribution. Indochina, Malaysia (Malay Peninsula, Sarawak, Sabah), Brunei, Indonesia (Sumatra, Kalimantan, Sulawesi, Maluku, Indonesian New Guinea), Philippines, Papua New Guinea.

Ecology. Lowland (freshwater swamp forest), submontane, and montane forests between 700–1800 m a.s.l. Threat: Least Concern.

Mesophlebion dulitense Holttum, Blumea 22(2): 229. 1975.

TEM: Amo, G Pagon, *Coode MC7539*; Amo, Bkt Retak, *Wong WKM438, Edwards 845*; Amo, G Pagon, *Coode MC7608*.

Distribution. Endemic to Borneo (Brunei, Sabah, Sarawak).

Ecology. In mature forests between 600–1500 m a.s.l. Threat: Rare in Brunei.

Mesophlebion falcatilobum Holttum, Fl. Males. Ser 2, Pterid. 1(5): 382. 1982.

BEL: Melilas, Sg Ingei, *Edwards 2370*; Batu Melintang, *Edwards 2347*. **TEM**: Amo, Sg Belalong (Amo), *Middleton DJM767*; Amo, Batu Apoi FR (K Belalong FSC), *Edwards 989*; Amo, Batu Apoi FR (K Belalong FSC), *Edwards 2055*; Amo, Sg Belalong (Amo), *Edwards 936*; Amo, Batu Apoi FR (K Belalong FSC), *Edwards 2056*; Amo, Bkt Belalong, *Middleton DJM801*; Amo, K Belalong, *Johns RJ6914*; Amo, Bkt Belalong, *Middleton DJM808*; Amo, Batu Apoi FR (K Belalong FSC), *Poulsen ADP134*; Amo, Ulu Belalong, *Idris et al. BRUN16651*; Batu Apoi, Sg Temburong (Batu Apoi), *Johns RJ6974*; Batu Apoi, Bkt Gelagas (Bkt Suang), *Simpson 2346*; Belalong, FSC, *Edwards 2113*; Amo, Belalong, FSC, *Nielsen 1900*; Amo, Belalong, FSC, *Cicuzza 2508*, *Cicuzza 2599*; Amo Sg Bela-

long, *Cicuzza 2622*, *Cicuzza 2626*. **TUT**: Lamunin, Ladan Hills FR, *Edwards 945*.

Distribution. Endemic to Borneo (Brunei, Sarawak).

Ecology. In mature lowland forests. Threat: Least Concern.

Mesophlebion motleyanum (Hook.) Holttum, Companion Handb. Ferns Brit. India 209. 1974.

TEM: Kpg Bakok, *Cicuzza 2703*; Amo, Bkt Belalong, *Poulsen ADP351*; Amo, Bkt Retak, *Wong WKM865*; Bangar, Pekan Bangar, *Ashton A77*. **TUT**: Lamunin, *Edwards 747*; Rambai, Ulu Tutong, *Johns RJ7641*.

Distribution. South Thailand, Malaysia (Malay Peninsula, Sarawak, Sabah), Brunei, Indonesia (Sumatra, Kalimantan).

Ecology. In mature forests; lowlands to 1200 m a.s.l. Threat: Rare in Brunei.

Mesophlebion oligodictyon (Baker) Holttum, Blumea 22(2): 227. 1975.

BEL: Labi, Andulau, *Cicuzza 2575*. **TEM**: Amo, K Belalong, *Ashton A53*; Amo, Sg Temburong, *Wong WKM1219*; Amo, Sg Temburong, *Johns RJ7402*; Amo, Sg Temburong, *Edwards 940*; Amo, K Belalong, *Johns RJ6973*; Amo, Sg Temburong, *Edwards 2159*; Amo Belalong FSC, *Cicuzza 2634*.

Distribution. Endemic to Borneo (Brunei, Kalimantan, Sarawak).

Ecology. Terrestrial or lithophyte along streams and on rocks along rivers in the lowlands. Threat: Least Concern.

Mesophlebion trichopodum (C.Chr.) Holttum, Blumea 22(2): 226. 1975.

TUT: Rambai, Bkt Bahak, *Kirkup DK498*.

Distribution. Malaysia (Malay Peninsula, Sarawak, Sabah), Brunei, Indonesia (Sumatra, Kalimantan).

Ecology. Terrestrial, along streams and in humid forests; sea level to 1000 m a.s.l. Threat: Rare in Brunei.

32.10. Plesioneuron (Holttum) Holtuum, Blumea 22: 232. 1975

Plesioneuron medusella Holttum, Fl. Males. Ser. 2, Pterid. 1(5): 400. 1982.

TUT: Lamunin, Benutan dam, *Edwards 931*.

Distribution. Endemic to Borneo (Brunei, Sarawak).

Ecology. Lithophytic in mature forests. Threat: Rare in Brunei.

32.11. Pronephrium C.Presl, Abh. Königl. Böhm. Ges. Wiss., ser. 5,6: 258. 1851

Pronephrium hosei (Baker) Holttum, Blumea 20(1): 120. 1972.

TEM: Amo, Sg Belalong (Amo), *Johns RJ6995*; Amo, Sg Temburong, *Johns RJ7146*; Amo, Sg Belalong (Amo), *Ashton A114*; Amo, K Belalong, *Johns RJ6969*; Amo, K Belalong, *Ashton A11*; Amo, Sg Temburong, *Edwards 935*; Amo, Batang Duri, *Schatz GS3287*; Batu Apoi, Bkt Gelagas (Bkt Suang), *Simpson 2436*; Batu Apoi, Kpg Selapon, *Dransfield SD1160*; Batu Apoi, *Edwards 2443*; Batu Apoi, *Samhan SN11*; Sg Sitam, *Edwards 2016*; Amo, Belalong, *Cicuzza 2635*.

Distribution. Borneo (Brunei, Kalimantan, Sabah, Sarawak), Philippines.

Ecology. Terrestrial or lithophyte on rocky stream banks in lowland forest to 500 m a.s.l. Threat: Least Concern.

Pronephrium menisciicarpon (Blume) Holttum, Blumea 20(1): 111. 1972.

BRM: Pengkalan Batu, Kpg Wasan, *Edwards 978*. **TEM**: Amo, K Belalong FSC, *Poulsen ADP291*; Amo, K Belalong, *Ashton A35*; Amo, Sg Belalong (Amo), *Edwards 2132*; Batu Apoi, *Edwards 2458*. **TUT**: Lamunin, *Edwards 754*.

Distribution. Malaysia (Malay Peninsula, Sarawak, Sabah), Brunei, Indonesia (Sumatra, Java, Kalimantan, Maluku, Indonesia New Guinea), Philippines, Papua New Guinea.

Ecology. In mature forests close to streams at low altitudes. Threat: Least Concern.

32.12. Sphaerostephanos J.Sm. in W.J.Hooker, Gen. Fil.:t.24. 1839

Sphaerostephanos heterocarpus (Blume) Holttum, Companion Handb. Ferns Brit. India: 209. 1974.

BEL: Labi, Sg Teraja, *Edwards 770*, *Edwards 2510*; Melilas, Sg Ingei, *Edwards 2364*; Melilas, Sg Ingei, *Edwards 2363*. **TEM**: Amo, Bkt Retak, *Johns RJ6702*; Amo, Bkt Retak, *Johns RJ6738*; Amo, Sg Temburong, *Johns RJ7252*; Amo, Batu Apoi FR (K Belalong FSC), *Poulsen ADP361*; Amo, Bkt Retak, *Wong WKM853*.

Distribution. China, Indochina, throughout Malesia, to Australia, and the Pacific Islands.

Ecology. Terrestrial, in primary forests; lowlands to 1500 m a.s.l. Threat: Least Concern.

Sphaerostephanos inconspicuus (Copel.) Holttum, Fl. Males., Ser. 2, Pterid. 1(5): 493. 1982.

TEM: Amo, Bkt Retak, *Johns RJ6619*; Amo, Bkt Retak, *Wong WKM894*; Amo, Bkt Retak, *Johns RJ6654*.

Distribution. Endemic to Borneo (Brunei, Sabah, Sarawak).

Ecology. Terrestrial, in primary montane forest between 1000–1800 m a.s.l. Threat: Rare in Brunei.

Sphaerostephanos larutensis (Bedd.) C.Chr., Index Filic. Suppl. 3: 172. 1934.

BRM: Pengkalan Batu, Kpg Wasan, *Edwards 972*. **TEM**: Amo, Sg Temburong, *Edwards 939*; Batu Apoi FR (K Belalong FSC), *Poulsen ADP290*. **TUT**: Lamunin, Benutan dam, *Edwards 933*; Pipeline Wasan, *Edwards 752*.

Distribution. Malaysia (Malay Peninsula, Sarawak, Sabah), Indonesia (Sumatra, Kalimantan), Brunei, Philippines.

Ecology. Terrestrial, in waterlogged sites within mature forests; lowlands to 1000 m a.s.l. Threat: Least Concern.

Sphaerostephanos latebrosus (Kunze ex Mett.) Holttum, Companion Handb. Ferns Brit. India 209. 1974.

TEM: Batu Apoi, *Edwards 2442*; Amo, Batu Apoi FR (K Belalong FSC), *Edwards 2060*; Sg Temburong, *Edwards 939*; Batu Apoi, *Poulsen ADP290*.

Distribution. Malay Peninsula, Brunei, Sumatra, Java, Philippines.

Ecology. Lowland mature forests, in humid sites or close to streams. Threat: Rare in Brunei.

Sphaerostephanos perglanduliferus (Alderw.) Holttum, Kalikasan 4: 59. 1975.

TEM: Amo, K Belalong, *Johns RJ6957*; Amo, Batu Apoi FR (K Belalong FSC), *Edwards 2061*; Amo, Sg Belalong (Amo), *Edwards 2108*; Amo, Sg Temburong, *Johns RJ7378*. **TUT**: Lamunin, Benutan dam, *Edwards 2333*.

Distribution. Malaysia (Sarawak, Sabah), Brunei, Indonesia (Sumatra, Sulawesi), Philippines, Micronesia.

Ecology. Terrestrial or lithophyte along streams and rivers; lowlands to 1200 m a.s.l. Threat: Least Concern.

Sphaerostephanos polycarpos (Blume) Copel. Univ. Cal. Publ. Bot. 16: 60. 1929.

BRM: Wasan, Pipeline, *Edwards 975*. **TEM**: Bangar, *Edwards 498*; Belalong, FSC, *Middleton DJM834*; Sg Temburong, *Johns RJ6959*.

Distribution. Indochina, throughout Malesia, to the Pacific Islands.

Ecology. Lowland forest. Threat: Least Concern.

Sphaerostephanos pterosporus (Alderw.) Holttum, Fl. Males., Ser. 2, Pterid. 1(5): 486. 1982.

BEL: Labi, Sg Mendaram, *Johns RJ6816*; Labi, Wasai Wong Kadir (= Wasai Rampayoh), *Johns RJ7448*; Telingan waterfall, *Ariffin et al. BRUN23692*; Rampayoh waterfall, *Johns RJ7427*; Mendaram valley, *Johns RJ6817*; Teraja waterfall, *Sands MS5689*. **TEM**: Amo, Bkt Belalong, *Middleton DJM807*; Amo, Batu Apoi FR (K Belalong FSC), *Poulsen ADP124*; Amo, Sg Belalong (Amo), *Edwards 937*; Batu Apoi, Bkt Gelagas (Bkt Suang), *Simpson 2394*; Batu Apoi, Bkt Gelagas (Bkt Suang), *Simpson 2474*; Batu Apoi, Bkt Gelagas (Bkt Suang), *Simpson 2324*; Bkt Patoi, *Edwards 901*; Sg Esu, *Edwards 2301*; Sg Belalong, *Edwards 2289*. **TUT**: Lamunin, Benutan dam, *Edwards 2239*; Sg Ingei, *Edwards 2365*.

Distribution. Malay Peninsula, Borneo (Brunei, Sarawak).

Ecology. Terrestrial or lithophyte along streams and rivers in lowland mature forests. Threat: Least Concern.

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An ITS phylogeny of *Festuca* s.l. clarifies the generic circumscription of the broad-leaved complex (Poaceae, Pooideae, Poeae, Loliinae)

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Abstract. To investigate the evolutionary relationships among species of *Festuca* s.l. we generated a nuclear ribosomal DNA ITS phylogeny recovering 10 strongly supported clades or genera: *Drymochloa, Festuca, Leucopoa, Locajonoa, Lolium, Hesperochloa, Munnikopoa* **gen. nov.**, *Pseudobromus*, *Valdesochloa* **gen. nov.**, and *Xanthochloa*. We make the necessary 51 new combinations in *Drymochloa* (*D. muelleri, D. pseudeskia, D. scariosa*), *Festuca* (*F. albaredae, F. ambilobensis F. lima, F. membranacea* subsp. *fontqueriana*), *Hesperochloa* (*H. aloha, H. altaica, H. amplissima, H. argentina, H. bajacaliforniana, H. campestris, H. dasyclada, H. dichoclada, H. elmeri, H. extremiorientalis, H. hallii, H. hubsugulica, H. modesta, H. molokaiensis, H. nitidula, H. parvigluma, H. pulchella, H. pulchella* ssp. *jurana*, *H. quadridentata, H. sinensis, H. sororia, H. spectabilis, H. subulata, H. washingtonica*) *Leucopoa* (*L. komarovii*), *Locajonoa* (*L. patula*), *Lolium* (*L. simensis*), *Munnikopoa* (*M. scabra*), *Pseudobromus* (*P. brevisetus, P. killickii, P. longipes, P. mekiste*), *Valdesochloa* (*V. asperella, V. breviglumis, V. caldasii, V. chiriquensis, V. lugens, V. superba, V. venezuelana*), and *Xanthochloa* (*X. baetica, X. durandoi, X. paniculata, X. sclerophylla, X. spadicea*); and provide a preliminary key to the genera. Lectotypes are designated for the names *Festuca amplissima* Rupr., *F. costata* var. *breviseta* Nees, *F. dichoclada* Pilg., *F. longipes* Stapf, *F. modesta* Nees, *F. nitidula* Stapf ex Hook. f., *F. patula* Desf., *F. subulata* var. *japonica* Hack., *F. superba* Parodi ex Türpe, and *Micropyrum albaredae* Paunero; and a neotype is designated for *Triticum patens* Brot.

Keywords: Classification, *Drymochloa*, *Hesperochloa*, *Leucopoa, Locajonoa*, *Lolium*, molecular phylogenetics, *Munnikopoa*, *Pseudobromus*, *Valdesochloa, Xanthochloa.*

INTRODUCTION

Festuca L. is a large group of primarily cool temperate grasses with ca. 682 species (POWO 2024), placed in the tribe Poeae, subtribe Loliinae Dumort. The genus is characterized morphologically in having the annual

or perennial lifeform, leaf blades mostly flat, or folded (involute) and often filiform, panicles narrow or open, spikelets 4–13-flowered and primarily laterally flattened, lemmas membranous to thinly coriaceous, usually 5-veined, dorsally rounded, with apices that are acute, entire or obscurely bidentate, unawned or short to long-awned, upper glumes that are usually 3-veined, floret callus thickened and glabrous, rachilla dorsoventrally compressed, lodicules hyaline, lanceolate, laterally lobed, and eciliate, ovary glabrous or apically hairy, and caryopses with a linear to oblong hilum at least half as long as the grain (Clayton and Renvoize 1986; Clayton et al. 2016; Stančík and Peterson 2007). *Festuca* s.l. is divided into two major groups (Torrecilla and Catalán 2002; Minaya et al. 2017): the narrow leaf clade (NLC) of *Festuca* s.s., ca. 600 species (Soreng et al. 2017, 2022; Peterson et al. 2018; Sylvester et al. 2020), and the broad leaf group/grade/clade (BLC), ca. 82 species. The following genera have historically been attributed to the Loliinae: *Ctenopsis* De Not., *Dielsiochloa* Pilg., *Drymochloa* Holub,, *Hellerochloa* Rauchert, *Megalachne* Steud., *Micropyrum* (Gaudin) Link, *Narduroides* Rouy, *Leucopoa* Griseb., *Locajonoa* Soreng, *Lolium* L. (synonyms *Micropyropsis* Romero Zarco & Cabezudo, *Schedonorus* P.Beauv.), *Patzkea* G.H.Loos, *Podophorus* Phil., *Pseudobromus* K.Schum., *Psilurus* Trin., *Vulpia* C.C.Gmel., *Wangenheimia* Moench, and *Xanthochloa* (Krivot.) Tzvelev. The generic taxonomy of the broad-leaved species complex is still unsettled, but the grade is decidedly African, Eurasian, and Indomalayan in origin, with a few species of *Leucopoa* identified from the Americas (Inda et al. 2013; Gallaher et al. 2022). The subtribe Loliinae was estimated to have a mean crown date of 18.47 Ma by Gallaher et al. (2022) while an earlier study suggested the *Schedonorus*–*Lolium* complex was already distributed in the western Mediterranean region around the mid-Miocene (13–8 Ma) [Inda et al. 2013].

A good summary and historical perspective of the systematics of subtribe Loliinae based on morphology and molecular DNA markers (nuclear ITS and chloroplast *trn*L-F), is given in Catalán et al. (2007). Ribosomal DNA ITS sequences (ITS_1 & ITS_2 spacers) have been successfully used in phylogenetic analysis in many angiosperms (Baldwin et al. 1995) and the marker has been very informative at the species level within the grasses, especially the Pooideae (Hsiao et al. 1995, 1999; Charmet et al. 1997; Gaut et al. 2000; Torrecilla and Catalán 2002; Quintanar et al. 2007; Romaschenko et al. 2012; Barberá et al. 2019) and has been used as a barcode (Peterson et al. 2014).

Within the broad-leaved *Festuca* clade (BLC), Palisot de Beauvois (1812) split *Festuca* s.l., erecting *Schedonorus*, and later Darbyshire (1993) moved *F.* subg. *Schedonorus* (P. Beauv.) Peterm. to *Lolium* so the paniclulate inflorescence and the presence of a lower glume in *L. arundinaceum* (Schreb.) Darbysh. and relatives could be incorporated in *Lolium* as recognized by most taxonomists today. *Pseudobromus* K. Schum. [type = *Festuca africana* (Hack.) Clayton] was erected to recognize species with transverse leaf blade veinlets and spikelets with 1–4 fertile florets (Schumann 1895). *Festuca* subg. *Hesperochloa* Piper (1906) [later raised to generic level by Rydberg (1912) as *Hesperochloa* (Piper) Rydb.] was also segregated from *Festuca* to accommodate *F. confinis* Vasey = *F. kingii* (S.Watson) Cassidy with stout extravaginal scaly stolons, usually broad, flat leaf blades, and hairy ovaries. *Festuca* subg. *Leucopoa* (Griseb.) Tzvel. was described to include dioecious or monoecious species with flat or convolute leaf blades 4–7 mm wide, lemmas that are awnless, sometimes short-pilose, and ovaries that are somewhat pilose at the tip (*F. sibirica* Hack. ex Boiss. ≡ *Leucopoa sibirica* Griseb. ≡ *Leucopoa albida* (Turcz. ex Trin.) V.I.Krecz. & Bobrov [Grisebach 1852; Tzvelev 1971]. *Drymochloa* [type = *Drymochloa drymeja* (Mert. & W.D.J.Koch) Holub ≡ *Festuca drymeja* Mert. & W.D.J.Koch] was used to include about eight monoecious species that have auriculate leaf sheaths, flat leaf blades 5–15 mm wide, awnless lemmas, and ovaries with densely pilose apices (Tzvelev 1976; Holub 1984, 1998; Foggi et al. 2005).

Based on *Festuca karatavica* (Burge) B. Fedtsch. (type), a perennial with flat leaf blades 2–10 mm wide, hyaline to membranous glumes, strongly 5-veined lemmas, and glabrous ovaries, Tzvelev (2006) erected *Xanthochloa* with two species. Originally, Tzvelev (1971) had placed the former species in *Festuca* subg. *Xanthochloa* (Kivot.) Tzvelev. *Patzkea* was erected to accommodate *Festuca coerulescens* Desf., *F. durandoi* Clausen, *F. paniculata* (L.) Schinz & Thell. the type, *F. patula* Desf., and *F. spadicea* L. species with 1-veined glumes and tuberose basal sheaths (Loos 2010; Scholz 2010). To accommodate *Micropyropsis tuberosa* Romero Zarco & Cabezudo that has spiciform racemes (i.e., *Lolium perenne* L.) and spikelets with two glumes (i.e., *L. arundinaceum*) with other species placed in *Lolium,* Banfi et al. (2017) made the combination, *Lolium tuberosum* (Romero Zarco & Cabezudo) Banfi, Galasso, Foggi, Kopecký & Ardenghi. To accommodate *Festuca coerulescens* [≡ *Lojaconoa coerulescens* (Desf.) Gand. nom. inval.] and therefore changing the status of *Festuca* sect. *Lojaconoa* Catalán & Joch. Müll, Soreng et al. (2022) erected *Locajonoa*. *Locajonoa coeulescens* has a tuberose culm base, flat leaf blades that are convolute near the base, pubescent panicle branches with antrorse hairs, and 1-veined lower glumes (Devesa and Martinez Sagarra 2020).

The Mexican, Central, and South American broad-leaved *Festuca* species were recently studied morphologically and phylogenetically using entire plastomes and nuclear rDNA 45S, 5S), and repetitive DNA elements (Moreno-Aguilar et al. 2022). They found that species of *Festuca* sect. *Glabricarpae* E.B. Alexeev (type = *F. breviglumis* Swallen) and *F.* subg. *Asperifolia* [type = *F. lugens* (E. Fourn.) Hitchc. ex Hern.-Xol.] including *F. superba* Parodi ex Türpe aligned in Mexico-Central-South American I clade (MCSAI) and *F.* subg. *Erosiflorae* E.B.Alexeev (type = *F. quadridentata* Kunth) and *F.* sect. *Ruprechtia* E.B. Alexeev (type = *F. amplissima* Rupr.) including *F. argentina* (Speg.) Parodi aligned in MCSAII. They also found ligule shape and whether it was ciliate or not, to be very diagnostic in circumscribing the 22 primarily polyploid species in their study.

In another recent study a nuclear phylogenomic tree depicts *Festuca* species (excluding *F. sinensis* Keng ex E.B. Alexeev and *F. mekiste* Clayton as outliers) in either a fine-leaved clade (FLC) and a broad-leaved clade (BLC) [GPWG III 2024]. These two clades are both strongly supported in their plastome tree where FLC + *Castellia tuberculosa* (Moris) Bor is sister to the BLC that includes four species of *Lolium, Patzkea paniculata* (L.) G.H.Loos, *Festuca mekiste*, and *F. muellerii* Vickery (*F. sinensis* not in this analysis).

The Flora Europaea (Tuten 1980) included the following nine Loliinae genera: *Castellia* Tineo, *Ctenopsis*, *Festuca*, *Lolium*, *Micropyrum*, *Narduroides*, *Psilurus*, *Vulpia*, and *Wangenheimia*. Forty years later the Flora Iberica (Devesa et al. 2020) included the following 10 Loliinae genera: *Castellia*, *Ctenopsis*, *Festuca*, *Lolium*, *Micropyropsis*, *Micropyrum*, *Narduroides*, *Psilurus*, *Vulpia*, and *Wangenheimia*. There appears to be little change in the generic concepts used in the recent treatment of the grasses in Spain despite a plethora of molecular DNA sequence studies. In our current paper we present evidence in our DNA ITS-derived phylogeny to support only two of the above genera (*Festuca* s.s. and *Lolium*). In addition, we provide strong support to recognize the following nine genera within the BLC: *Drymochloa, Leucopoa, Locajonoa, Hesperochloa, Lolium, Munnikopoa* **gen. nov.**, *Pseudobromus*, *Valdesochloa* **gen. nov.**, and *Xanthochloa*.

There have been many DNA sequence-derived phylogenies of the Loliinae utilizing plastid markers, and these for the most part have been unable to adequately resolve generic boundaries within *Festuca* s.l. (Charmet et al. 1997; Gaut et al. 2000; Torrecilla and Catalán 2002; Torrecilla et al. 2004; Catalán et al. 2007; Quintanar et al. 2007; Inda et al. 2008, 2013; Moreno-Aguilar et al. 2022). Therefore, in our study we choose to rely solely on the nuclear ribosomal DNA ITS marker (most available and widespread genetic marker with high resolution) with an expanded data set of species to construct a phylogeny of *Festuca*, specifically focusing on the broad-leaved complex. We include the type species of all but one of the genera sometimes attributed to the BLC along with many of their putative relatives, and a broad sampling of species generally attributed to the NLC. Based on our new phylogeny we expand the number of genera in the BLC to nine genera (two new, one resurrected, and one subsumed) and include their associated taxonomic changes.

MATERIALS AND METHODS

Taxon sampling

We sampled 130 specimens, representing 109 species (79 species of broad-leaved *Festuca*) and 11 genera representing Loliinae. A list of taxa including authorities, voucher information, and GenBank numbers is provided in Appendix 1. DNA was extracted from silica-dried material collected by the authors or was obtained from herbarium specimens, principally housed at the United States National Herbarium (US). Additionally, we used 79 ITS sequences taken from GenBank.

It is necessary to include the types of genera and other higher taxa when conducting molecular studies and revising taxonomic classifications based on phylogenetic results so that the names of higher taxa can be correctly applied to lineages. The following species included in our analyses are the types of their respective genus*: Drymochloa drymeja, Festuca lugens* (≡ *Valdesochloa* **gen. nov.**), *Festuca ovina* L., *Festuca scabra* Vahl (*Munnikopoa* **gen. nov.**), *Hesperochloa kingii, Leucopoa sibirica, Locajonoa coerulescens, Lolium perenne, Patzkea paniculata*, and *Pseudobromus silvaticus*.

The study was designed to characterize relationships among species of *Festuca* s.l. with an emphasis on species that have been included in the BLC. We included five outgroup species: *Avenella flexuosa* (L.) Drejer (subtr. Airinae Fr.), *Helictochloa bromoides* (Gouan) Romero Zarco (subtr. Helictochloinae Röser & Tkach), *Peyritschia erectifolia* (Hitchc.) P.M. Peterson, Soreng, Romasch. & Barberá (subtr. Aveninae J. Presl), *Phalaris arundinacea* L. (subtr. Phalaridinae Fr.), and *Poa billardierei* St.-Yves (subtr. Poinae Dumort.) [Soreng et al. 2022].

Phylogenetic methods

All procedures related to sequencing the ITS region were performed in the Laboratory of Analytical Biol-

ogy at the Smithsonian Institution. Detailed methods for DNA extraction, amplification, and sequencing are given in Romaschenko et al. (2012) and Peterson et al. (2010a, 2010b, 2012, 2014, 2015a, 2015b, 2016). Geneious Prime v.2020.1.4 (Kearse et al. 2012) was utilized for contig assembly of bidirectional sequences and Muscle (Edgar 2004) to align consensus sequences and adjust the final alignment. The Bayesian trees were constructed with MrBayes v3.2.7 (Huelsenbeck and Ronquist 2001; Ronquist et al. 2012). All compatible branches were saved.

Bayesian analysis was performed under default settings. The search was initiated with random starting trees and was run for ten million generations with every 1000th iteration being sampled. Upon completion of the search, the variance of split sequences was less than 0.01 and the potential scale reduction factor was close or equal to 1.0 indicating convergence of the chains (Huelsenbeck and Ronquist 2001). The effective sample size (ESS) value was greater than 100, and 25% of the sampled values were discarded. Posterior probabilities (PP) of ≥0.95 indicate a credible interval of probability, so we consider this as strong support.

The parsimony bootstrap analyses (Felsenstein 1985) were performed using program IQ-Tree 2.3.5 implementing ultrafast bootstrap approximation (with 10000 bootstrap replicates) to assess branch supports (Minh et al. 2013; Hoang et al. 2018). Bootstrap (BS) values of 95–100% were interpreted as strong support.

The analysis was initially run with 264 *Festuca* s.l. species (185 spp. in the NLC, see Table 1). Our unpublished tree (not presented here) included 185 species aligning within the *Festuca* s.s. clade. These are presented in Table 1 where we also indicate what genera they have been historically attributed to. Upon finding a well-supported NLC in this preliminary analysis we then narrowed that dataset to an informative subset of samples, while retaining all samples aligning outside the NLC that had unique sequences and removing duplicates of the same taxon for the final analysis.

RESULTS

Phylogeny

Thirty-eight percent (49/130) of the sequences in our study are newly reported in GenBank, and 60.8% (79) are previously published sequences (Appendix 1). The ITS dataset included 130 sequences with 754 nucleotide sites, of which 366 sites were constant (48.5411% of all sites) and 273 sites were parsimony informative. The Best-fit model according to Bayesian Information Criterion (BIC; IQ-Tree program) was SYM+I+I+R3.

The Bayesian tree from the ITS region (Fig. 1) is well resolved and we recovered 10 strongly supported clades (PP = 0.96–1.00), BS = 99–100) we refer to as: *Drymochloa, Festuca, Leucopoa, Locajonoa, Lolium, Hesperochloa, Munnikopoa* gen. nov., *Pseudobromus*, *Valdesochloa* gen. nov., and *Xanthochloa*; and a single unsupported accession of *Leucopoa calabrica* (Huter, Porta & Rigo ex Hack.) H. Scholz & Foggi (≡ *Festuca calabrica* Huter, Porta & Rigo ex Hack.). *Leucopoa calabrica* is sister via a long branch to *Hesperochloa*, aligning in a grade between *Locajonoa* and *Hesperochloa.*

In our overall unpublished tree we included 185 species of *Festuca* s.s. (Table 1) and these form a clade sister to the BLC (Fig. 1). Within, *Festuca* s.s. there are some species that were formerly attributed to: *Ctenopsis*, *Dielsiochloa*, *Micropyrum*, *Narduroides*, *Psilurus*, *Vulpia*, or *Wangenheimia*.

DISCUSSION

Delimitation of generic ranks within *Festuca* have historically been problematic and our results based on a phylogeny derived from the nuclear ribosomal DNA ITS marker, are a work in progress, requiring validation by incorporation of a larger sample and additional DNA markers. We strive to recognize a genus as a clade of species sharing a common ancestor, with the exception of genera that are a result of repeated hybridizations (see treatment of *Polypogon* Desf. in Peterson et al. 2025). As taxonomists, we always have a subjective choice to recognize a large clade of related species, i.e., *Festuca* s.l., or many clades composed of smaller monophyletic units. We choose the latter, and as such, propose a classification separating *Festuca* s.l. into 10 genera: *Drymochloa, Festuca s.s., Leucopoa, Locajonoa, Lolium, Hesperochloa, Munnikopoa* gen. nov., *Pseudobromus*, *Valdesochloa* gen. nov., and *Xanthochloa*. By following this phylogenetic principle of classification *Vulpia* can never be used since, based on molecular DNA studies, all species formerly attributed to this genus in modern accounts align within NL *Festuca* s.s. (Torrecilla et al. 2004). *Lolium* is almost universally accepted with or without *Schedonorus* included in historic and recent taxonomic treatments (Tutin 1980; Devesa et al. 2020). Some more recent floristic treatments accept some of the broad-leaved segregate genera, such as, *Drymochloa, Leucopoa*, *Patzkea* (= *Xanthochloa* in our study), and *Schedonorus*, but still retain the use of *Vulpia* (Euro+Med 2006+; Tzvelev and Probatova 2019). *Pseudobromus* s.s. (BL species) is also accepted by some (Clayton 1970).

Torrecilla and Catalán (2002) outlined three broad-leaved *Festuca* clades in their ITS strict consensus tree:

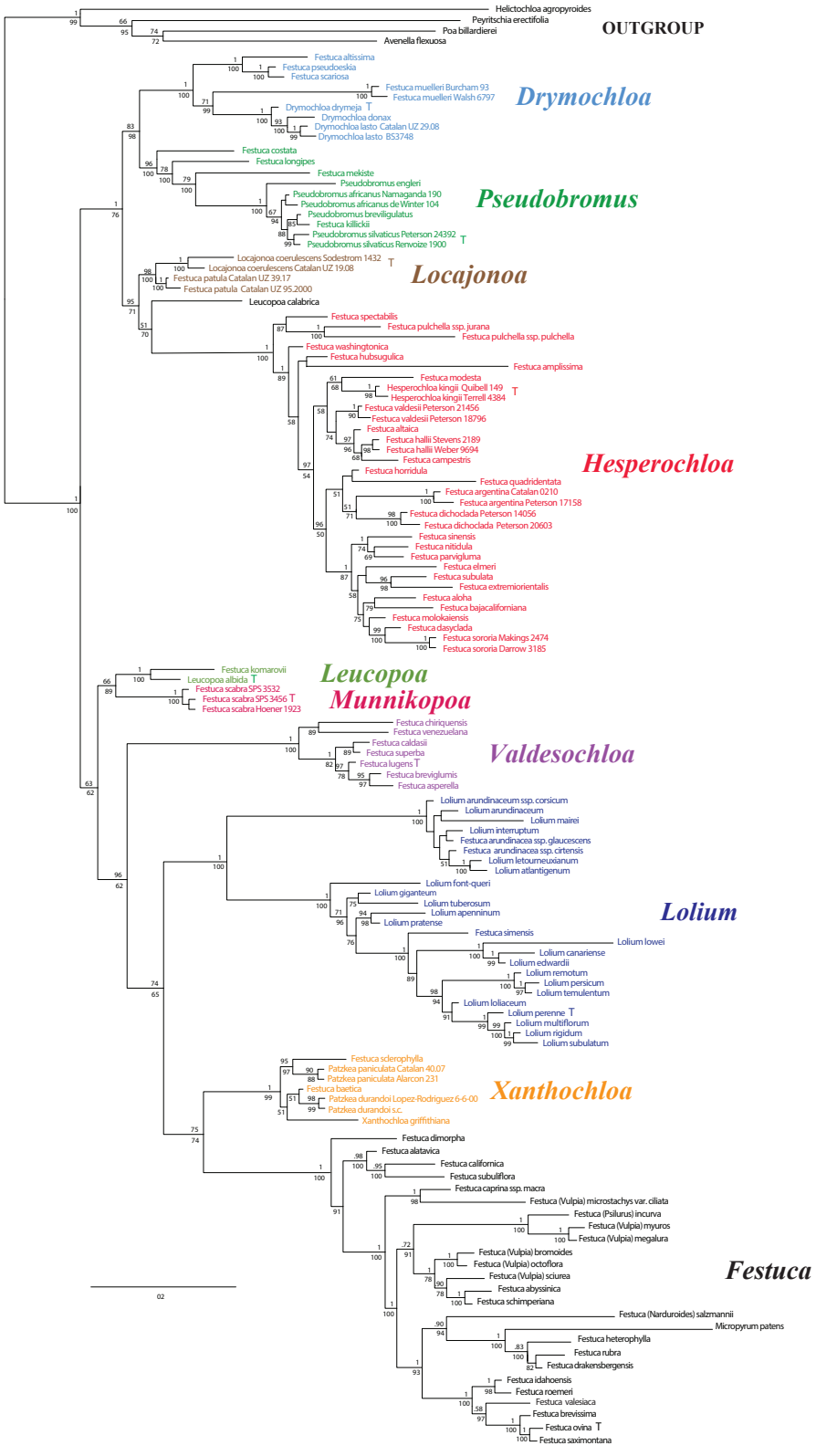

Figure 1. Bayesian tree inferred from ITS sequences of the broad-leaved species of *Festuca* s.l. Numbers (0.50–1) above the branches indicate posterior probabilities and numbers (50–100) below the branches indicate bootstrap. T = type of the genus. Scale bar = 0.2% substitutions per site.

Table 1. List of species in our overall unpublished tree in *Festuca* s.s. (narrow-leaved) clade. Species that have been attributed to other genera are labeled with superscript number as follows: [1]*Ctenopsis*, [2]*Dielsiochloa*, [3]*Micropyrum*, [4]*Narduroides*, [5]*Psilurus*, [6]*Vulpia*, and [7]*Wangenheimia*. GenBank numbers are listed for some species. Other samples with unpublished ITS sequences include collector and number; all are housed at the United States National Herbarium (US).

Festuca abyssinica Hochst. ex A.Rich. — Peterson 24019 (US), Peterson 24037 (US), Peterson 24039 (US), Peterson 24125 (US), Peterson 24347 (US); *F. actae* Connor — AY524829; *F. agustinii* Linding. — EF584918, AY099005; *F. alatavica* (Hack. ex St.-Yves) Roshev. — Soreng PI3500041 (US); [3]*F. albaredae* (Paunero) P.M.Peterson, Romasch. & Soreng — AF478495; [6]*F. alopecuros* Schousb. — AF478491, KF977183; *F. alpina* Suter — AF303415, KF917222; *F. amethystina* L. — Czywcz 293 (US), Freiberg in 1951 (US); *F. ampla* Hack. — EF584920, EF584921; *F. andicola* Kunth — EF584922; *F. aragonensis* — AF519975; *F. arenaria* Osbeck — KX166307; *F. arenaria* Osbeck — KX166348; *F. arietina* Klokov — KP796238; *F. arietina* Klokov — KP796239; *F. arizonica* Vasey — Peterson 7828 (US), Peterson 7857 (US); *F. asperula* Vickery — KY368831, J598992, KY368831; *F. auriculata* Drobow — MG215841, MG216480; *F. baffinensis* Polunin — Holmen 20 (US), EF584925, GQ324476; *F. benthamiana* Vickery — KY368824; *F. borbonica* Spreng. — KY368840; *F. borderi* (Hack.) K. Richt. — AF303403, KF917227; *F. bosniaca* Kummer & Sendtn. — KY368815, KY368815; *F. brachyphylla* Schult. & Schult. f. — Talbot 2005 (US); *F. brachyphylla* subsp. *breviculmis* Fred. — Alexander 4544 (US), Maguire 26102 (US); *F. brevipila* R. Tracey — AF147151, AF147165; *F. brevis* (Boiss. & Kotschy) Asch., Schweinf. & Muschl. — AF478489, KF917252; *F. brevissima* Jurtzev — Soreng 6170 (US), Talbot CHO012-16 (US); [6]*F. bromoides* L. — Banks 57 (US), Thomas 10016 (US), KF917207, Peterson 24123 (US); *F. burnatii* St.-Yves — AY099007; *F. californica* subsp. *parishii* (Piper) Darbysh. — Parish 2490 (US); *F. californica* Vasey — Raven 10758 (US), Hoover 4940 (US); *F. calligera* (Piper) Rydb. — Hitchcock 13224 (US), Darrow 2947 (US); *F. camusiana* St.-Yves — KY368841; *F. capillifolia* Dufour ex Roem. & Schult. — AF303419, KF977184; *F. caprina* Nees — Sylvester 3713 (US), KY368825; *F. caprina* var. *irrasa* Stapf — Sylvester 3542 (US), Sylvester 3547 (US); *F. caprina* var. *macra* Stapf — Sylvester 3406 (US), Sylvester 3619 (US); *F. carpatica* F. Dietr. — AY099006; *F. casapaltensis* Ball — KY368832; *F. chimborazensis* E.B.Alexeev — KF917238; *F. chodatiana* (St.-Yves) E.B.Alexeev — KY368842, Peterson 24348 (US), Peterson 24396 (US); [6]*F. ciliata* Gouan — AF478486; *F. circummediterranea* Patzke — HM453195; *F. claytonii* E.B.Alexeev — KY368843; *F. clementei* Boiss. — AF478482; *F. cochabambana* E.B.Alexeev — EF584931; *F. compressifolia* J. Presl — KY368833; *F. contracta* Kirk — KY368819; *F. coxii* (Petrie) Hack. — AY524825; *F. cuzcoensis* Stančík & P.M.Peterson — EF584932; *F. dalmatica* (Hack.) Richt. — AJ508378, AY254371; *F. deflexa* Connor — AY524838; [1]*F. delicatula* (Lag.) P.M.Peterson, Soreng & Romasch. — AY118096; *F. dimorpha* Guss. — AF519982; *F. drakensbergensis* Sylvester, Soreng & M. Sylvester — Sylvester 3360 (US), Sylvester 3595 (US); *F. edlundiae* S.G. Aiken, L.L. Consaul & Lefk. — EF584936, MG216580; *F. elata* Keng ex E.B.Alexeev — EF584937; *F. elegans* Boiss. — AF303406; *F. eskia* Ramond ex DC. — AF303412, KF917340; *F. fasciculata* Forssk. — AF303402, JQ972948; *F. filiformis* Pourr. — Watherby 7037 (US), AJ240160; *F. fimbriata* Nees — KY368834; *F. flacca* Hack. ex E.B.Alexeev — EF584938; [2]*F. floribunda* (Pilg.) P.M.Peterson, Soreng & Romasch. — JF697719; *F. fragilis* (Luces) B.Briceno — KF917247, KF917248; *F. francoi* Fern.Prieto, C.Aguilar, E.Dias & M.I.Gut. — EF584939; *F. frederikseniae* E.B.Alexeev — MG216612, MG216276; *F. frigida* Grossh. — AF478481; *F. gautieri* (Hack.) K.Richt. — AF303414; [6]*F. geniculata* (L.) Lag. & Rodr. — AF478490, JQ972947; *F. gilbertiana* E.B.Alexeev & S.M.Phillips — KY368844; *F. glacialis* Mi gev. — AF303428; *F. glauca* Vill. — Harrison in 5/6/1919 (US), anonymous in 1909 (US); *F. glumosa* Hack. ex E.B.Alexeev — EF584940; *F. gracillima* Hook. f. — KY368820; *F. guestphalica* Boenn. ex Rchb. — EF584941; *F. halleri* All. — EF584942; *F. hephaestophila* (Nees) Nees — EF584943; *F. heterophylla* Lam. — Holmgren in 30/6/1938 (US), AJ240159; *F. hieronymi* Hack. — KY368835; *F. hintoniana* E.B.Alexeev — EF584945; *F. humilior* Nees & Meyen — KU883499; *F. hyperborea* Holmen ex Fred. — EF584946, MG215765; *F. hystrix* Boiss. — AF543513; *F. iberica* (Hack.) K.Richt. — AY118087; *F. idahoensis* Elmer — Penland 1318 (US), Piemeisel 10 (US), Baker 9563 (US); [5]*F. incurva* (Gouan) Gutermann — JQ972945; *F. indigesta* Boiss. — AF303426; *F. intercedens* (Hack.) Ludi ex Bech. — EF584948; *F. javorkae* Májovský — AY254372; *F. jubata* Lowe — EF584949; *F. juncifolia* Chaub. — AF478478; *F. kashmiriana* Stapf — Stewart 17835 (US); *F. kirelowii* Steud. — KY999965, KY999968; *F. kryloviana* Reverd. — KY999967, KY999969; [1]*F. lachenalii* (C.C.Gmel.) Spenn. — AF478494; *F. laevigata* Gaudin — EF584950; *F. laxa* Host — KY368816; *F. lemanii* Bastard — AF147135, AF147136; [7]*F. lima* (L.) P.M.Peterson, Romasch. & Soreng — AF478498, JQ972949; *F. lenensis* Drobow — Talbot 2005 (US), Talbot 2005 (US); *F. ligulata* Swallen — Peterson 18878 (US), Peterson 10050 (US); *F. longiauriculata* Fuente, Ortunez & Ferrero Lom. — AF478479; *F. longivaginata* Tovar — EF584951; *F. luciarum* Connor — AY524828; *F. macrophylla* Hochst. ex A.Rich. — KY368845; *F. madida* Connor — AY524833; *F. magellanica* Lam. — KY368829; *F. maritima* L. — AF478492; *F. matthewsii* (Hack.) Cheeseman — AY524836; *F. matthewsii* subsp. *aquilonia* Connor — AY524835; *F. matthewsii* subsp. *latifundii* Connor — AY524837; *F. matthewsii* subsp. *pisamontis* Connor — AY524831; *F. mediterranea* (Hack.) Prain — AJ508376, AJ508375; [4]*F. megalura* Nutt. — Peterson 13791 (US), Peterson 13921(US); *F. melanopsis* Foggi, Gr.Rossi & M.A.Signorini — EF584952; [6]*F. membranacea* (L.) Druce — AY118090, KF917301; [6]*F. membranacea* subsp. *fontqueriana* (Melderis & Stace) P.M.Peterson, Romasch. & Soreng — AF478488, KF917260; [6]*F. microstachys* Nutt. — Crampton 1875 (US); [6]*F. microstachys* var. *ciliata* A.Gray ex Beal — Raven 18208 (US), Sharsmith 3528 (US); *F. minutiflora* Rydb. — Spreadborough 21034 (US), MG216207, MG216712; *F. multinodis* Petrie & Hackel — AY524827; [6]*F. muralis* Kunth — AF478484, AY118091; [6]*F. myuros* L. — Atwood Ex86B01 (US), Peterson 18750 (US), AJ240162; *F. nardifolia* Griseb. — EF584954; *F. nemoralis* T rpe — KY368821; *F. nevadensis* (Hack.) K.Richt. — AF478477; *F. nitida* Kit. ex Schult. — KY368826, KY368826; *F. norica* (Hack.) K. Richt. — EF584955; *F. novae*-zelandiae (Hack.) Cockayne — AY524832; *F. occidentalis* Hook. — Calder 12451 (US), EF397235, EF584956; [6]*F. octoflora* var. *glauca* (Nutt.) Fernald — Stevens 242 (US); [4]*F. octoflora* var. *hirtella* (Piper) Hitchc. — Barkley 3133 (US); [6]*F. octoflora* Walter — Freeman 54128 (US), Demaree 30495 (US); *F. orthophylla* Pilg. — EF584957; *F. ovina* L. — Stevens 1200 (US), Taylor 1044 (US); *F. pallens* Host — AY254373; *F. pampeana* Speg. — KY368822; *F. panciciana* (Hack.) K. Richt. — JQ972951; *F. paradoxa* Desv. — Leoschke 2326 (US); *F. parodiana* (St.-Yves) Nicora — EF584959; *F. perrieri* A. Camus — KY368846; *F. peruviana* Infantes — KY368836; *F. petraea* Guthnick — EF584961, EF584962; *F. picturata* G. Pils — KY368827; *F. pilgeri* St.-Yves — KY368847; *F. plebeia* R. Br. — KJ598994; *F. plicata* Hack. — AF478483, KF917335; *F. polesica* Zapal. — AF171130; *F. pringlei* St.-Yves — KY368837; *F. prolifera* var. *lasiolepis* Fernald — MG216314, MG216559; *F. pseudodalmatica* Krajina ex Domin —

AY254374; *F. pseudovina* Hack. ex Wiesb. — Stevens 2580 (US), AY254375; *F. pumila* Chaix — KY368817, KY368817; *F. purpurascens* Banks & Sol. ex Hook. f. — EF584964; *F. pyrenaica* Reut. — AF303423; *F. pyrogea* Speg. — KY368830; [6]*F. quadriflora* Honck. — AF303413, Hermann 4137 (US), Silveus 102 (US); *F. queriana* Litard. — AF532957; *F. richardsonii* Hook. — Talbot 139-59 (US); *F. rigescens* (J. Presl) Kunth — Peterson 12993 (US), Peterson 13067 (US), deMichel 2855 (US); *F. rivularis* Boiss. — AF478475, EF584967; *F. roemeri* (Pavlick) E.B. Alexeev — Hitchcock 23518 (US), Swallen 5985 (US); *F. roemeri* var. *klamathensis* B.L.Wilson — Wilson 6938 (US); *F. rothmaleri* (Litard.) Markgr.-Dann. — AF478476; *F. rubra* L. — Peterson 18424 (US), Dore 1947 (US); *F. rubra* subsp. *arctica* (Hack.) Govor. — JN999220; *F. rubra* subsp. *arenaria* (Osbeck) F.Aresch. — Porsild 364 (US); *F. rubra* subsp. *arenicola* E.B.Alexeev — Muenscher 8967 (US); *F. rubra* subsp. *commutata* Gaudin — Chase 12264 (US), Wilson 7963 (US), Glerisch 2152 (US); *F. rubra* subsp. *fallax* (Thuill.) Nyman — AF147148; *F. rubra* subsp. *littoralis* (G. Mey.) Auquier — AF147150; *F. rubra* subsp. *vallicola* (Rydb.) Pavlick — Suksdorf 7539 (US); *F. rupicaprina* Beck — AF171145; *F. rupicola* Heuff. — AJ508379, AY254376; [4]*F. salzmannii* (Boiss.) Boiss. ex Coss. — AF478497, JQ972946; *F. saximontana* Rydb. — Peterson 18349 (US), Peterson 18525 (US); *F. saximontana* subsp. *purpusina* (St.-Yves) Tzvelev — Keck 4698 (US), Thompson 7529 (US); *F. scabriculmis* K.Richt. — EF584970; *F. schimperiana* A.Rich. — Peterson 24362 (US); [6]*F. sicula* C. Presl — AY118089, KF917356; *F. stricta* Host — AY254377, EF584972; *F. subantarctica* Parodi — EF584973; *F. subuliflora* Scribn. — Thompson 11569 (US), Baker 156 (US); *F. subverticillata* (Pers.) E.B.Alexeev — Peterson 15784 (US); *F. tatrae* (Czakó) Degen — HM453196; *F. thurberi* Vasey — Gillespie 6306 (US), Peterson 7816 (US); *F. tolucensis* Kunth — EF584976; *F. trachyphylla* (Hack.) R.P.Murray — Wilson 8193 (US), Cochrane 13228 (US); *F. ulochaeta* Nees — KU883501; *F. ultramafica* Connor — AY524826; *F. vaginalis* (Benth.) Lægaard — AY254379, EF584977; *F. valesiaca* Schleich. ex Gaudin — Soreng 7896 (US), Soreng 7926 (US); *F. ventanicola* Speg. — KY368823; *F. versuta* Beal — Albers 43Ph000 (US), Silveus 2721 (US); *F. violacea* Gaudin — EF584979; *F. viridula* Vasey — Thompson 15009 (US), MG215968; *F. vivipara* (L.) Sm. — Holmen 118 (US); *F. viviparoidea* Krajina ex Pavlick — EF584980, MG215979; [6]*F. vulpioides* Steud. — KY368828; *F. wagneri* (Degen, Thaisz & Flatt) Soó — AY254378; *F. woronowii* Hack. — KY368818; *F. yalaensis* Joch. Müll. & Catalán — GQ849279.

1) contains three species all placed in *Xanthochloa* in our analysis; 2) contains five species placed in *Drymochloa* in our analysis with addition of *F. pseudoeskia* Boiss. and *F. scariosa* Lag., and these five *Drymochloa* species are sister to two species we place in *Locajonoa* with addition of *F. patula* (= *F. triflora*), and sister to all in this clade is *Hesperochloa kingii*; and 3) contains 10 species of *Lolium* s.l. (including *Schedonorus*), all of these were confirmed in our study.

Of the BL species in our study, only *Xanthochloa* did not include the type, *X. karatavica*. However, we feel confident that our sample of the Afghanistan *Xanthochloa griffithiana*, is morphologically and genetically similar to the Turkestan *X. karatavica* since Tzvelev (2006) indicated they were "very close," and that there is "no basis to keep these two species within *Festuca*." Sennikov and Tojibaev (2021) also recognized the morphological similarity of *X. karatavica* and *X. griffithiana* by relegating the latter species as a synonym of the former but choosing to place it in *Lolium* as *L. karatavicum* (Bunge) Sennikov. In addition, Bor (1960) and IPNI (2025) place *Festuca subspicata* var. *griffithiana* St.-Yves (≡ *X. griffthiana*) as a synonym of *Leucopoa karatavica* (Bunge) V.I.Krecz. & Bobrov and *Festuca karatavica* (Bunge) B.Fedtsch., respectively.

Moreno-Aguilar et al. (2022) identified a set of diagnostic morphological characters within seven subgenera in the Loliinae. Their nuclear rDNA 5S-dervied phylogeny included a Mexico-Central-South American I clade (MCSAI) with six species all found in our *Valdesochloa* gen. nov. clade, whereas members of their MCSCII are scattered in their tree or attributed to *Leucopoa* (*F. kingii* and *F. spectabilis* Jan ex Bertol.) and in our tree all are found in our *Hesperochloa* clade. Five of our species of *Valdesochloa*, gen nov. are aligned in MCSA I in their plastome tree (Moreno-Aguilar et al. 2022). Additionally, in their nuclear rDNA 5S-derived phylogeny, there are well supported clades for *Lolium, Patzkea* (= *Xanthochloa* as treated below), and *Pseudobromus*; and *Drymochloa lasto* (Boiss.) Holub is sister to *Locajanoa patula* (Moreno-Aguilar et al. 2022).

Even though *Leucopoa calabrica* does not appear within the *Locajonoa* clade (see Fig. 1), by virtue of its proximity near *Locajonoa*, there is a good possibility it would align within *Locajonoa* with the inclusion of additional species in our analysis. It is possible that long-branch-attraction pulled it away from the *Locajonoa* clade where it is weakly supported as sister to *Hesperochloa*. Other species placed in *Leucopoa* in Euro+Med Plantbase (Müller and Foggi 2011) are: *Leuc. carpatica* (F.Dietr.) H.Scholz [aligns within *Festuca* s.s. in our unpublished preliminary ITS-derived tree in a clade with *Leuc. dimorpha* (Guss.) H.Scholz & Foggi ≡ *Festuca dimorpha* Guss., see Fig. 1 for the later taxon], *Luec. caucasica* (Boiss.) V.I. Krecz. & Bobrov, *Leuc. laxa* (Host) H.Scholz & Foggi (aligns in *Festuca* s.s. in our prilimnary unpublished ITS-derived tree), *Leuc. pulchella* (Schrad.) H.Scholz & Foggi ≡ *Hesperochoa pulchella,* comb. nov., *Leuc. sclerophylla* (Boiss. ex Bisch.) V.I. Krecz. & Bobrov ≡ *Xanthochloa sclerophylla*, comb. nov., *Leuc. spectabilis* (Jan ex Bertol.) H.Scholz & Foggi ≡ *Hesperostipa spectabilis*, comb. nov.. and *Leuc. stygia* (H. Scholz & Strid) H.Scholz & Foggi.

Tzvelev and Probatova (2019) in the grasses of Russia recognized five genera in the Loliinae: *Drymochloa, Festuca, Lolium, Schedonorus*, and *Vulpia*. Their subge-

neric classification of *Festuca* includes two subgenera *Festuca* s.s. and *F.* subg. *Hesperochloa*, each with three sections. The latter subgenus containing two species we place in *Hesperochloa* (*F. altaica* Trin. and *F. hubsugulica* Krivot.), one species we place in *Leucopoa* [*L. albida* (Turcz. ex Trin.) V.I.Krecz. & Bobrov], and one species we include in *Xanthochloa* (*F. sclerophylla*).

Our placement of *Festuca muelleri* Vickery within the *Drymochloa* clade is incongruent with GPWG III (2024) nuclear tree where it is sister to *Patzkea paniculata* (≡ *Xanthochloa paniculata*, comb. nov., see below). Their study additionally includes *Drymochloa drymeja* (type) which pairs with *Locajonoa coerulescens*. We feel reasonably confident that *Festuca muelleri* should be placed in *Drymochloa* since we include two accessions of this species that form a clade within *Drymochloa,* and we are confident in our determination since we generated the sequence of *Burcham 93* (from US) and it pairs with *Walsh 6797* (*KJ598993) determined as *F. muellerii* in the Australasian Virtual Herbarium (AVH 2025). Perhaps the large number of samples included in our study of species from the BLC improved the functionality of the algorithm used in the Bayesian analysis.

There are quite a few species with narrow, filiform or conduplicate leaf blades (≤ 2 mm wide) that are placed in our *Hesperochloa* clade and at least two species, *F. molokaiensis* Soreng, P.M. Peterson & Catalán and *F. sinensis* with this trait have been included in NLC based on plastome-derived phylogenies (Moreno-Aguilar et al. 2022; GPWG 2024). These species could be NL/BL hybrids, and, in addition, they could have multiple copies of ITS but we only sampled those that align within the BL clade. *Festuca bajacalifornia*na is another species with narrow leaf blades and morphologically, it is similar to *F. ovina*. However, there is no plastome data available for this species, but we suspect it might align in the NLC.

TAXONOMY

We make the necessary new combinations in *Drymochloa, Festuca*, *Hesperochloa, Leucopoa, Locajonoa, Lolium, Pseudobromus*, and *Xanthochloa* that are supported by our ITS-derived phylogeny, describe two new genera, *Munnikopoa* and *Valdesochloa* with more new combinations, and provide a key to the genera. An asterisk (*) indicates the species were included in our ITS phylogeny.

Drymochloa Holub, Folia Geobot. Phytotax. 19(1): 96. 1984.

Type: *Drymochloa sylvatica* (Pollich) Holub, Folia Geobot. Phytotax. 19(1): 99. 1984.

Description

Perennials tufted, sometimes with butt sheaths persistent and investing base of culm with fibrous dead sheaths (*D. drymeja*), basal innovations extravaginal, sometimes intravaginal; rhizomes wanting, if present, short (*F. pseudoeskia*). *Culms* 20–150 cm tall, erect. *Leaf sheaths* open for most of their length, glabrous, smooth or scabrous, sometimes antrorsely scabrous (*F. muelleri*); *ligules* 1.5–6 mm long, membranous, eciliate, often lacerate; *blades* 2–15 mm wide (1–2 mm wide in *F. pseudoeskia* and *F. scariosa*), flat, sometimes conduplicate (in *F. pseudoeskia* and *F. scariosa*), scabrous or smooth. *Inflorescence* usually an open panicle, ovate, elliptic or pyramidal, 10–50 cm long, axis scaberulous or smooth. *Spikelets* 5–15 mm long (12–15 mm long in *F. muelleri*, all other spp. 5–8 mm), 2–6-flowered, elliptic or oblong, laterally compressed; *rachilla* glabrous or sometimes scaberulous (*F. muelleri*); *floret callus* glabrous, rarely pubescent (*F. muellerii*); *glumes* shorter than the spikelet, the lower 0.6–0.9 as long as the upper, chartaceous, sometimes hyaline (*F. pseudoeskia*) or sometimes membranous (*D. sylvatica*); *lower glumes* 2–8 mm long, lanceolate, 1-veined, sometimes 3–5-veined (*F. muelleri*); *upper glumes* 3–6.2 mm long, lanceolate, 1-,3, or 5-veined; *lemmas* 3.5–10 mm long, ovate, lanceolate, sometimes oblong (*F. scariosa*), chartaceous, sometimes scarious (*F. scariosa*), 5-veined, sometimes 3-veined (*D. sylvatica*), scaberulous or scabrous, apex entire, rarely mucronate (*F. scariosa*); *paleas* 2-veined, keels scaberulous. *Flowers* perfect; *lodicules* 2; *anthers* 2–5 mm long, 3; *ovary* pubescent on apex, sometimes glabrous (*F. muelleri*). *Caryopses* hairy at apex, sometimes glabrous (*D. donax*).

Species

Drymochloa asthenica (Hook. f.) Holub, **D. donax* (Lowe) H.Scholz & Foggi **D. drymeja* (Mert. & W.D.J.Koch) Holub, *D. drymeja* subsp. *exaltata* (C.Presl) Foggi & M.A.Signorini, *D. grandis* (Coss. & Durieu) Holub, **D. lasto* (Boiss.) Holub, *D. sinomutica* (X. Chen & S.M.Phillips) Tzvelev, *D. sylvatica* (= **Festuca altissima* All.), and three more (see below).

Distribution

Europe, Asia, Africa, Macronesia, Australasia (*F. muelleri*).

Drymochloa muelleri (Vickery) P.M.Peterson, Romasch. & Soreng, **comb. nov.**

Bas.: *Festuca muelleri* Vickery, Contr. New South Wales Natl. Herb. 1: 9. 1939.

Type: Australia, New South Wales, Victoria, Mt. Buller, Mar 1853, *F.J.H. von Mueller s.n.* (holotype: K000913271[image!]; isotype: MEL223497 [image!]).

Drymochloa pseudoeskia (Boiss.) P.M.Peterson, Romasch. & Soreng, **comb. nov.**

Bas.: *Festuca pseudoeskia* Boiss., Elench. Pl. Nov. 91. 1838.

Type: Spain, in summit glareosis in Sierra Nevada, alt. 9000-10000 ft, Aug 1837, *P.E. Boissier 195* (lectotype, designated by Burdet et al., Candollea 36: 568. 1981: G-Boissier 00165735 [image1]; isolectotypes: BM001067171 [image!], CWU0051272 [image!], E00381967 [image!], G00165734 [image!], G00165736-43 [images!], K000912898 [image!], LE00009843 [image!], LE00009844 [image!], TUB008867 [image!], US-1006889!).

Drymochloa scariosa (Lag. ex Willk.) P.M.Peterson, Romasch. & Soreng, **comb. nov.**

Bas.: *Poa scariosa* Lag., Gen. Sp. Pl. 3. 1816.

Type: Spain, Caidiz, puerto de las Palomas, Pico Coros, 30STF8874, 1331 m, 29 Apr 2002, *V. de la Fuente García s.n.* (neotype, designated by V. Fuente García et al., Taxon 52(3): 609. 2003: MAF-162539).

(=) *Festuca granatensis* Boiss., Elench. Pl. Nov.: 93. 1838.

Type: Spain, in omnibus montibus Regn. Granat. 4000–9500 ft, Jul 1837, *P.E. Boissier 198* (lectotype designated by Burdet et al., Candollea 36: 566. 1981: G00165721 [image!]; isolectotypes: BM001067172 [image!], GOET006291 [image!], HAL0107007 [image!], JE00006373 [image!], LE00009784 [image!], LE00009785 [image!], LE00009786 [image!], MICH1108669 [image!], MPU027854 [image!], MPU027855 [image!], W0033067 [image!]).

(≡) *Festuca scariosa* (Lag.) Asch. & Graebn., Syn. Mitteleur. Fl. 2(1): 502. 1900.

Festuca albaredae (Paunero) P.M.Peterson, Romasch. & Soreng, **comb. nov.**

Bas.: *Micropyrum albaredae* Paunero, Trab. & Com. Simpos. v. Fl. Eur. 1967: 326. 1969.

Type: Spain, Province of Cáceres, Alía, near the Guadarranque River, 25 May 1949, *E. Paunero s.n.* (MA144296-2 [image!] lectotype designated here; isolectotype: MA144296 [image!]).

(≡) *Triticum patens* Brot., Fl. Lusit. 1: 120. 1804.

Type: Spain, Province of Cáceres, Alía, near the Guadarranque River, 25 May 1949, *E. Paunero s.n.*; MA144296-2 [image!] neotype designated here; isoneotype: MA144296 [image!]).

(≡) *Micropyrum patens* (Brot.) Rothm. ex Pilg., Bot. Jahrb. Syst. 74(4): 567. 1949.

Notes

Unfortunately, the collections that Felix de Avellar Brotero (Brot.) used for his "Flora Lusitanica" are lost (Ana Isabel D. Correia, Curator of vascular plants, LISU, pers. comm.). *Festuca patens* Steud. [Syn. Pl. Glumac. 1(6): 428. 1854] already exits so we have chosen the next available synonym, *F. albaredae*, and we use the type of the latter name to neotypify *Triticum patens*. *Micropyrum albaredae* (= *Festuca albaredae*) was listed as a synonym of *Micropyrum patens* in Flora Europaea (Stace 1980), Euro+Med PlantBase (Valdés and Scholz 2009), and Flora Iberica (López and Devesa 2020).

Festuca ambilobensis **(**A.Camus) P.M.Peterson, Romasch. & Soreng, **comb. nov.**

Bas.: *Pseudobromus ambilobensis* A. Camus, Bull. Soc. Bot. France 102: 120. 1955.

Type: Madagascar, Domaine central de Madagascar (N): massif de Marivorahona, au SW de Manambato, haute Mahavavy du N, distr. d'Ambilobe, 2000–2244 m, Mar 1951, *H. Humbert & R. Capuron 25809* (holotype: P-00446512 [image!]; isotype: P-00446513 [image!]).

Notes

Pseudobromus ambilobensis is sister to *Festuca pilgeri* St.-Yves in the nuclear DNA tree, and both species clearly lie in the *Festuca* NLC (GPWG 2024). This species has narrow leaf blades similar to the majority of species attributed to the NLC (Camus 1955).

Festuca lima (L.) P.M.Peterson, Romasch. & Soreng, **comb. nov.**

Bas.: *Cynosurus lima* L., Sp. Pl.: 72. 1753.

(≡) *Eleusine lima* (L.) Lam., Tabl. Encycl. 1: 203. 1791 [1792].

Type: Spain, *P. Löfling #74a* (lectotype, designated by Hernández Cardona, Anales Jard. Bot. Madrid_37: 86. 1980, central specimen on the sheet: LINN-HL91-4 [image!]).

(≡) *Wangenheimia lima* (L.) Trin., Fund. Agrost.: 132. 1820.

(≡) *Poa lima* (L.) Trin., Mém. Acad. Imp. Sci. St.-Pétersbourg, Sér. 6, Sci. Math. 1(4): 392. 1830.

Notes

In our overall unpublished tree that included 185 narrow-leaved species of *Festuca*, *Wangenheimia lima* (GenBank JQ972949) aligns in a grade between *Festuca capillifolia* Dufour ex Roem. & Schult. and *F. magellanica* Lam. *Wangenheimia lima* was also found in the the *Festuca* NLC by GPWG (2024).

Festuca membranacea subsp. ***fontqueriana*** (Melderis & Stace) P.M.Peterson, Romasch. & Soreng, **comb. nov.**

Bas.: *Vulpia* f*ontqueriana* Melderis & Stace, Collect. Bot. (Barcelona) 7: 782. 1968.

Type: Spain, Prov. Cáldiz, the Marismas near Sanlúcar, in bare dry sand under sparse *Pinus pinea* L. trees, elevation less than 50 ft, 30 Apr 1961, *C.A. Stace 411* (holotype: BM001067184 [image!]; isotype: RSA0000508 [image!]).

Notes

In our overall unpublished tree that included 185 narrow-leaved species of *Festuca*, two accessions of *Vulpia fontqueriana* are embedded but not paired in a clade with two specimens of *F. membranacea* (L.) Druce. These four accessions are then sister in a strongly supported clade to two accessions of *F. alopecuros* Schousb.

Hesperochloa (Piper) Rydb., Bull. Torrey Bot. Club 39: 106. 1912.

Type: *Hesperochloa kingii* (S. Watson) Rydb., Bull. Torrey Bot. Club 39(3): 106. 1912.

Description

Perennials tufted, butt sheaths often persistent and investing base of culm; with compacted often fibrous dead sheaths, basal innovation intravaginal or extravaginal, sometimes with short rhizomes, rarely elongated (some individuals of *F. parviflora*). *Culms* 15–150 mm long, erect, sometimes geniculately ascending (*F. bajacalifornia, F. hubsugulica, F. nitidula*). *Leaf sheaths* usually open for most of their length, rarely closed 0.5–0.75 (*F. pulchella*), usually glabrous, sometimes puberulent; *ligules* usually less than 1 mm long, membranous, truncate or with *ligules* 1.5–12 mm long (*F. dichoclada, F. modesta, F. molakaiensis, F. spectabilis*), membranous, obtuse to acute; *blades* 0.4–12 (–23) mm wide, flat, conduplicate, sometimes convolute (*F. elmeri, F. quadridentata*), glabrous or hairy. *Inflorescence* an open or contracted (*F. aloha, F. argentina, H. kingii, F. molokaiensis, F. washingtonica*) panicle 4–45 cm long. *Spikelets* 5–16 mm long, (2–) 3–7 (–10)-flowered, oblong, lanceolate, elliptic, ovate, sometimes cuneate (*F. elmeri, F. subulata*) or obovate (*F. parvigluma*), laterally compressed; often with *rachilla* internodes up to 1.5 mm long, these usually scaberulous; *floret callus* usually obtuse, glabrous, rarely pubescent (*F. argentina*); *glumes* shorter than the spikelet, the lower, the lower 0.5 to as long as the upper, chartaceous, membranous, or hyaline; *lower glumes* 1–7.5 mm long, lanceolate, sometimes ovate (*F. parvigluma*), 1-veined; *upper glumes* 2–9 mm long, lanceolate, sometimes ovate (*F. parvigluma*) 3-veined, sometimes 1-veined (*F. subulata*); *lemmas* 5–11 mm long, lanceolate, oblong or ovate, 5-veined, chartaceous or sometimes membranous, unawned, entire or awned, the awns 1–20 mm long, sometimes mucronate (*F. aloha, F. quadridentata*); *paleas* 2-veined, scabrous, keels scabrous, sometimes the keels ciliolate (*F. argentina*). *Flowers* perfect, sometimes dioecious (*F. hubsugulica, H. kingii*) or monoecious (*F. altaica*); *lodicules* 2; *anthers* 0.5–5 mm long, 3; *ovary* pubescent on apex or glabrous. *Caryopses* glabrous or hairy at apex (*F. parvigluma, F. subulata*).

Species

**Hesperochloa kingii* and 23 more, including one subspecies (see below).

Distribution

North America, Central America, South America, Pacific (Hawaii), Europe, and temperate Asia.

****Hesperochloa aloha*** (Catalán, Soreng & P.M.Peterson) P.M.Peterson, Romasch. & Soreng, **comb. nov.**

Bas.: *Festuca aloha* Catalán, Soreng & P.M.Peterson, J. Bot. Res. Inst. Texas 3(1): 51–54, f. 1, A–J. 2009.

Type: U.S.A., Hawaii, Kauai, Hanalei District, Kalalau Rim, Kalalau side below and W of the first Kalalau lookout, 790 m, 13 Mar 1992, *K.R. Wood & S. Perlman 1701* (holotype PTBG-17679!; isotype US-3252239!).

***Hesperochloa altaica** (Trin.) P.M.Peterson, Romasch. & Soreng, **comb. nov.**

Bas.: *Festuca altaica* Trin., Fl. Altaic. 1: 109–110. 1829.

Type: Russia, Siberia, in summa alpe ad fontem fl. Acjulac rarissima, 1826, *Ledebour & Meyer s.n.* (lectotype designated by Tzvelev, Zlaki SSSR 388. 1976: LE01010145-2 [image!]).

(=) *Festuca scabrella* Torr. in Hooker, Fl. Bor.-Amer. 2: 252, pl. 233. 1840.
Type: *T. Drummond 187*; s.d.; USA: Rocky Mountains (lectotype K000913247 [image!], GH (photo US), NY-97944, US-556126! fragm. ex herb. Torrey).

***Hesperochloa amplissima** (Rupr.) P.M.Peterson, Romasch. & Soreng, **comb. nov.**

Bas.: *Festuca amplissima* Rupr., Bull. Acad. Roy. Sci. Bruxelles 9(2): 236. 1842.

Type: Mexico, Veracruz: Vaquería de Jacal, Pic d'Orizaba, 10000 ft, Jun–Oct 1840, *H. Galeotti 5766* (lectotype, designated by Gonzalez-Ledesma et al., Biotam. 12: 52. 2001 (first step); lectotype, designated here (second step): BR00000686415 [image!]; isolectotypes BR000000686352 [image!], BR00000686351 [image!], BR00000686382 [image!], BR00000686451 [image!], LE00000725 [image!], US-2875372! fragm. ex W, W0031816 [image!]).

Notes

The lectotype includes an annotation label by E. Alexeev dated IV 1980 indicating the specimen is a lectotype.

***Hesperochloa argentina** (Speg.) P.M.Peterson, Romasch. & Soreng, **comb. nov.**

Bas.: *Poa argentina* Speg. Revista Fac. Agron. Vet. La Plata 3(30–31): 584–585. 1897.

Type: Argentina, Santa Cruz, Hab. ad margim orientalem Lago Argentino, 1884, *C. Tonini s.n.* (holotype LP001626 [image!]; isotypes BAA00000487 [image!], US-81670!).

(≡) *Festuca argentina* (Speg.) Parodi, Physis (Buenos Aires) 11: 498. 1935.

***Hesperochloa bajacaliforniana** (Gonz.-Led. & S.D.Koch) P.M.Peterson, Romasch. & Soreng, **comb. nov.**

Bas.: *Festuca bajacaliforniana* Gonz.-Led. & S.D.Koch, Novon 4(1): 28–29, f. 3. 1994.

Type: Mexico, Baja California, Sierra de San Pedro Martir, N slope of Cerro "2828', near 31.02N 115.27W, 2800 m, 14 Sep 1968, *R. Moran 15619* (holotype ENCB; isotypes LL00208541 [image!], MSC0085291 [image!], SD00000046 [image!], US-2886915!).

***Hesperochloa campestris** (Rydb.) P.M.Peterson, Romasch. & Soreng, **comb. nov.**

Bas.: *Festuca campestris* Rydb., Mem. New York Bot. Gard. 1: 57. 1900. **nom. nov.**

Type: Washington: Spokane Co.: collected on prairies, 18 Jun 1884, *W.N. Suksdorf 118* (holotype US00132498!).

Festuca scabrella var. *major* Vasey, Contr. U.S. Natl. Herb. 1(8): 278–279. 1893.

***Hesperochloa dasyclada** (Hack. ex Beal) P.M.Peterson, Romasch. & Soreng, **comb. nov.**

Bas.: *Festuca dasyclada* Hack. ex Beal, Grass. N. Amer. (ed. 2) 2: 602. 1896.

Type: U.S.A, Utah, 1875, *C.C. Parry 93* (lectotype, designated by Darbyshire & Pavlick, Phytologia 82(2): 76. 1997: US-556197!; isolectotypes GH00023726 [image!], ISC-v-0000534 [image!], MO8979333–5 [images!], NY00381051 [image!]).

(≡) *Argillochloa dasyclada* (Hack. ex Beal) W.A.Weber, Phytologia 55(1): 1. 1984.

***Hesperochloa dichoclada** (Pilg.) P.M.Peterson, Romasch. & Soreng, **comb. nov.**

Bas.: *Festuca dichoclada* Pilg., Bot. Jahrb. Syst. 37: 514. 1906.

Type: Peru, Ancash, in declivibus montium Cordillera Blanca supra Caraz, 3300–3600 m, 9 Jun 1903, *A. Weberbauer 3230* (B-10-0002570 [image!] lectotype designated here; isolectotypes B-10-0002571 [image!], BAA00000856 [image!], MOL00007849 [image!], US-2875396! fragm. ex B).

***Hesperochloa elmeri** (Scribn. & Merr.) P.M.Peterson, Romasch. & Soreng, **comb. nov.**

Bas.: *Festuca elmeri* Scribn. & Merr., Bull. Torrey Bot. Club 29(7): 468. 1902, *nom. cons.* against *Festuca howelii* Hack. ex Beal.

Type: U.S.A., California, Santa Clara Co., Stanford University, Apr 1901, *A.D.E. Elmer 2101* (holotype US-556198!; isotype MICH1108668 [image!]).

***Hesperochloa extremiorientalis** (Ohwi) P.M.Peterson, Romasch. & Soreng, **comb. nov.**

Bas.: *Festuca extremiorientalis* Ohwi, Bot. Mag. (Tokyo) 45: 194. 1931.

Type: Korea, Kankyo-Hokudo, Kwaysanryon, 24 Jul 1930, *J. Ohwi 2500* (holotype Herb. Univ. Imp. Kyotoensis; isotype US-1647258! ex herb. J. Ohwi).

(=) *Festuca subulata* var. *japonica* Hack., Bull. Herb. Boissier 7(9): 713. 1899.

Type: Japan, Nikko, *J. Matsumura 173* **(**W1916-0004585 [image!] ex Herbarium E. Hackel, lectotype designated here; isolectotype US-0101561! ex Herb. Hack.).

(≡) *Festuca subulata* subsp. *japonica* (Hack.) T.Koyama & Kawano, Canad. J. Bot. 42: 875. 1964.

***Hesperochloa hallii** (Vasey) P.M.Peterson, Romasch. & Soreng, **comb. nov.**

Bas.: *Melica hallii* Vasey, Bot. Gaz. 6(12): 296–297. 1881. Type: USA, Colorado, Rocky Mts., Lat. 39º, 1862, *Hall & Harbour 621* -- no. *Hall 7* (lectotype? [Pavlick annotation May 1981]: US00134197!; isolectotype MO2151730, US00134198!, US00134199!).

(≡) *Festuca hallii* (Vasey) Piper, Contr. U.S. Natl. Herb.10: 31. 1906.

***Hesperochloa hubsugulica** (Krivot.) P.M.Peterson, Romasch. & Soreng, **comb. nov.**

Bas.: *Festuca hubsugulica* Krivot., Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk SSSR 17: 77. 1955.

Type: Mongolia, locus Hubsugul, vallis Arassaj., 13 Jul 1902, *V. Komarov s.n.* (holotype LE?).

(=) *Festuca popovii* E.B.Alexeev, Byull. Moskovsk. Obshch. Isp. Prir. Otd. Biol. 83(5): 94. 1978.

Type: Russia, Buryatiya, Lacus Baical, fretum Czivyrkuiski, insula (Lochmatyi Kaltygoi) in saxis ripae septentrionalis, 54°01′ N, 103°06′ E, 25 Jun 1954, *M.G. Popov, G.A. Peschkova & P.A. Novokschonov s.n.* (holotype: NSK0000434 [image!]).

(≡) *Festuca insularis* Popov, *nom. illeg. hom.*, Bot. Mater. Gerb. Inst. Bot. Akad. Nauk Kazahsk. SSR 18: 4. 1957.

***Hesperochloa modesta** (Nees) P.M.Peterson, Romasch. & Soreng, **comb. nov.**

Bas.: *Festuca modesta* Nees, Syn. Pl. Glumac. 1: 316. 1855 [1854].

Type: Nepal, *J.F. Royle 161* (lectotype LIV1952.121.10825ii (2 of 3) [image!]; isolectotypes LIV1952.121.10825i [image!], LIV1952.121.10825iii [image!]).

(≡) *Drymochloa modesta* (Nees) Holub, Preslia 70(2): 104. 1998.

***Hesperochloa molokaiensis** (Soreng, P.M.Peterson & Catalán) P.M.Peterson, Romasch. & Soreng, **comb. nov.**

Bas.: *Festuca molokaiensis* Soreng, P.M. Peterson & Catalán, J. Bot. Res. Inst. Texas 3(1): 54-55, f. 1K. 2009.

Type: U.S.A., Hawaii, Molokai, Kupaia Gulch, on steep slopes in mesic forest, 800 m, 3 Apr 2007, *H.L. Oppenheimer, S. Perlman & N. Tangalin H40704* (holotype: BISH-728771!).

***Hesperochloa nitidula** (Stapf ex Hook. f.) P.M.Peterson, Romasch. & Soreng, **comb. nov.**

Bas.: *Festuca nitidula* Stapf ex Hook. f., Fl. Brit. India 7(22): 350. 1897.

Type: China, Valley of (Tibet), 15,000 ft, *R. Strachey & J.E. Winterbottom 1* (BR6863241 [image!] lectotype designated here; isolectotype BM000885638 [image!]). Basionym.

Notes

Annotated by E.B. Alexeev in Feb 1980 as an isoneotype.

***Hesperochloa parvigluma** (Steud.) P.M.Peterson, Romasch. & Soreng, **comb. nov.**

Bas.: *Festuca parvigluma* Steud., Syn. Pl. Glumac. 1: 305. 1855.

Type: ex Hrbo. Mus. Lugd. Batav. Japonia, *Bürger s.n.* (isotype: S-G-6683 [image!]).

Notes

Bürger is the collector as annotated by E.B. Alexeev in Dec 1981, as an isotype.

Hesperochloa pulchella (Schrad.) P.M.Peterson, Romasch. & Soreng, **comb. nov.**

Bas.: *Festuca pulchella* Schrad., Fl. Germ. (Schrad.) i. 336. t. 5. 1806.

Type: Germany, Salisburgensibus, *Miclichhofer s.n.* (isotype: LE00009850 [image!]).

(≡) *Leucopoa pulchella* (Schrad.) H.Scholz & Foggi, Willdenowia 35(2): 243 (2005).

Hesperochloa pulchella subsp. ***jurana*** (Gren.) P.M.Peterson, Romasch. & Soreng, **comb. nov.**

Bas.: *Festuca pulchella* var. *jurana* Gren., Mém. Soc. Émul. Doubs Ser. 3, 10: 925. 1869.

Type: Hab. Cimes du Jura, le Reculet, au vallon d'Ardran, le Colombier. Basionym.

(≡) *Leucopoa pulchella* subsp. *jurana* (Gren.) H.Scholz & Foggi, Willdenowia 35(2): 243 (2005).

Hesperochloa quadridentata (Kunth) P.M.Peterson, Romasch. & Soreng, **comb. nov.**

Bas.: *Festuca quadridentata* Kunth, Nov. Gen. Sp. (quarto ed.) 1: 154. 1815 [1816].

Type: Ecuador, Chimborazo, Guamote, 2860 m, *F.W.H.A. von Humboldt & A.F.A. Bonpland 3221* (holotype P00669427 [image!]; isotypes BAA00002067 [image!], BAA00002068 [image!], P00625328 [image!]).

Hesperochloa sinensis (Keng ex E.B.Alexeev) P.M.Peterson, Romasch. & Soreng, **comb. nov.**

Bas.: *Festuca sinensis* Keng ex E.B.Alexeev, Byull. Moskovsk. Obshch. Isp. Prir. Otd. Biol. 93(1): 112.1988.

Type: China (Gansu, Sichuan).

Hesperochloa sororia (Piper) P.M.Peterson, Romasch. & Soreng, **comb. nov.**

Bas.: *Festuca sororia* Piper, Contr. U.S. Natl. Herb. 1(5): 197. 1913.

Type: U.S.A., Arizona, Rincon Mts, 2286 m, Sep 1891, *G.C. Nealley 177* (holotype US-45866!; isotypes GH00023751 [image!], MO992959 [image!], NY00381071-3 [image], PH00014092 [image!], US-919881!).

(≡) *Festuca subulata* var. *sororia* (Piper) St.-Yves, Candollea 2: 285. 1925.

Hesperochloa spectabilis (Jan ex Bertol.) P.M.Peterson, Romasch. & Soreng, **comb. nov.**

Bas.: *Festuca spectabilis* Jan ex Bertol., Fl. Ital. 1: 612. 1834.

Type: Italy, M. Baldo, *G. Jan 68.40* (isotypes BM001067178 [image!], K00912861 [image!], W18890256285 [image!]).

Hesperochloa subulata (Trin.) P.M.Peterson, Romasch. & Soreng, **comb. nov.**

Bas.: *Festuca subulata* Trin., Mém. Acad. Imp. Sci. St.-Pétersbourg, Sér. 6, Sci. Math. 2(2): 173. 1832.

Type: U.S.A., Alaska, Ile de Sitcha, *Mertens s.n.* (holotype: LE?).

(=) *Festuca jonesii* Vasey, Contr. U.S. Natl. Herb. 1(8): 278. 1893.

Type: U.S.A., Utah, City Creek Canyon, 7300 ft, 17 Jul 1880, *M.E. Jones 1868* (holotype US-556194!; isotypes BM000578796 [image!], BR6863678 [image!], CAS000123974 [image!], CM0208 [image!], GH00023728 [image!], MICH1108672 [image!], PH00014073 [image!], RSA0006519 [image!]).

(≡) *Festuca subulata* var. *jonesii* (Vasey) St.-Yves, Candollea 2: 284. 1925.

Hesperochloa washingtonica (E.B.Alexeev) P.M.Peterson, Romasch. & Soreng, **comb. nov.**

Bas.: *Festuca washingtonica* E.B.Alexeev, Byull. Moskovsk. Obshch. Isp. Prir. Otd. Biol. 87(2): 115. 1982.

Type: U.S.A., Washington, Chelan County, Wenatchee National Forest, Cashmere Ranger District, Peavine Canyon, T22N R19E S27, 47.369825°, -120.444165°, 3 Jun 1960, *J.G. Smith 133* (holotype LE00009875 [image!]; isotype WTU-V-36 [image!]).

Leucopoa Griseb., Fl. Ross. [Ledebour] 4(13): 383. 1852.

Type: *Leucopoa albida* (Turcz. ex Trin.) V.I.Krecz. & Bobrov., Fl. SSSR 2: 495. 1934.

(≡) *Leucopoa sibirica* Griseb., *nom. illeg. superfl.*

(≡) *Festuca sibirica* Hack. ex Boiss., Fl. Orient. [Boiss.] 5: 626. 1884.

Description

Perennials tufted, butt sheaths, pubescent (*F. komarovii*) or glabrous (*L. albida*), persistent and investing base of culm with fibrous dead sheaths), basal innovations intravaginal or extravaginal (sometimes in *L. albida*). *Culms* 20–45 cm tall, erect. *Leaf sheaths* open for most of their length, smooth or scaberulous; *ligules* 0.4–0.7 mm long, membranous, eciliate or ciliate (*F. komarovii*); *blades* (1.5–) 2–4 mm wide, flat, conduplicate (*L. albida*) or pruinose (*F. komarovii*), glabrous, margins smooth or scabrous. *Inflorescence* a contracted (*L. albida*) or open (*F. komarovii*) panicle 3–10 cm long, the branches smooth or scabrous. *Spikelets* 6–12 mm long, 2–7-flowered, oblong (*L. albida*) or obovate (*F. komarovii*), laterally compressed; *rachilla* glabrous or sometimes scabrous (*L. albida*); *floret callus* glabrous; *glumes* shorter than the spikelet, the lower 0.75–0.9 as long as the upper, hyaline (*L. albida*) or membranous (*F. komarovii*); *lower glumes* 3.5–5 mm long, lanceolate, 1-veined; *upper glumes* 4–6 mm long, lanceolate or ovate, 1–3-veined; *lemmas* 5.8–9 mm long, elliptic (*L. albida*) or oblong (*F. komarovii*), 5-veined, chartaceous (*F. komarovii*) or membranous (*L. albida*), smooth or papillose (*F. komarovii*) apex entire; *paleas* 2-veined, keels scaberulous. *Flowers* dioecious; *lodicules* 2; *anthers* 3–4.5 mm long, 3; *ovary* pubescent on apex. *Caryopses* hairy at apex.

Species

**Leucopoa albida*, *L. olgae* (Regel) Krecz. & Bobrov, and one more (see below).

Distribution

Temperate and tropical Asia.

****Leucopoa komarovii*** (Krivot.) P.M.Peterson, Romasch. & Soreng, **comb. nov.**

Bas.: *Festuca komarovii* Krivot., Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk SSSR 17: 80. 1955.

Type: Russia. Prov. Irkutsk, Distr. Tunca, Montes Sajanenses, trajectus Char-Daban, 2 Jun 1902, *V. Komarov s.n.* (holotype LE01011328 [image!]).

Locajonoa Soreng, J. Syst. Evol. 60(3): 480. 2022, replaced name for *Festuca* sect. *Lojaconoa* Catalán & Joch. Müll., Taxon 55(1): 141. 2006, non *Lojaconoa* Bobrov (1967).

Type: *Locajonoa coerulescens* (Desf.) Soreng., J. Syst. Evol. 60(3): 481. 2022.

(≡) *Festuca coerulescens* Desf., Fl. Atlant. 1: 87. 1798.

(≡) *Patzkea coerulescens* (Desf.) H.Scholz., Willdenowia 40(2): 200. 2010.

Description

Perennials tufted, butt sheaths thickened or not (*F. patula*) and forming a tuberose base (anatomically with many sclerenchymatous cells), persistent and investing base of culm with fibrous dead sheaths (*F. coerulescens*), basal innovations intravaginal. *Culms* 60–130 cm tall, erect, nodes and internodes glabrous and smooth. *Leaf sheaths* glabrous; *ligules* 0.5–4.6 mm long (0.5–1 mm long in *F. coerulescens* and 1.5–4.6 mm in *F. patula*), membranous, apex truncate or obtuse; *blades* 2–7 mm wide, flat, scabrous, glabrous. *Inflorescence* an open panicle 5–30 cm long (5–10 cm long in *F. coerulescens* and 10–30 cm in *F. patula*), axis pubescent (*F. coerulescens*) or smooth. *Spikelets* 10–13 mm long, 3–6-flowered, elliptic, laterally compressed; *glumes* shorter than the spikelet, the lower ¾ as long as the upper, hyaline (*F. coerulescens*) or chartaceous, apices acuminate; *lower glumes* 4.5–5.5 mm long, lanceolate, 1-veined; upper glumes 5.5–6.5 mm long, oblong, 3-veined; *lemmas* 6–8.5 mm long (6–7 mm long in *F. coerulescens* and 7.8–8.5 mm in *F. patula*), lanceolate, 5-veined, chartaceous, puberulous (*F. coerulescens*) or scabrous (*F. patula*), apex attenuate, sometimes mucronate (*F. coerulescens*); *paleas* 2-veined. *Flowers* perfect; *lodicules* 2; *anthers* 3.5–4 mm long, 3; *ovary* apex densely strigose with stiff hairs. *Caryopses* hairy at apex.

Species

**Locajonoa coerulescens* (Desf.) Soreng and one more (see below).

Distribution

Europe and northern Africa.

Locajonoa patula (Desf.) P.M.Peterson, Romasch. & Soreng, **comb. nov.**

Bas.: *Festuca patula* Desf., Fl. Atlant. 1: 86–87. 1798.
Type: Habitat prope Bone et La Calle (Illustration in Fl. Atlant. 1: plate 20. 1798, lectotype designated here).

(=) *Festuca triflora* Desf., Fl. Atlant. 1: 87, t. 20. 1798, *nom. illeg. hom.*

(≡) *Patzkea patula* (Desf.) H.Scholz, Willdenowia 40(2): 200. 2010.

Lolium L., Sp. Pl. 1: 83. 1753.

Type: *Lolium perenne* L., Sp. Pl. 1: 83. 1753.

(≡) *Festuca perennis* (L.) Columbus & J.P.Sm., Aliso 28: 65. 2010.

Description

Annuals or *perennials,* usually tufted, sometimes with short rhizomes. *Culms* 10–200 cm tall, erect, geniculately ascending, or decumbent (rarely cormose: L. tuberosum). *Leaf sheaths* usually open for most of their length, glabrous or scabrous, auricles falcate or not falcate; *ligules* 0.1–4 mm long, membranous, eciliate; *blades* (1–) 2–15 mm wide, glabrous or scabrous. *Inflorescence* 4–30 cm long, a spike with sessile-inserted spikelets oriented radially to the main axis or a panicle. *Spikelets* 6–20 (–25) mm long, (2–) 3–12 (–15)-flowered, oblong, laterally compressed; *rachilla* glabrous or scaberulous; *floret callus* glabrous; *glumes* shorter than the spikelet, as long, or longer than the spikelet, 3–9-veined, lanceolate or oblong, membranous, chartaceous, or coriaceous, apices acute or obtuse; *lower glumes* 2–7 mm long or absent; *upper glumes* 3–28 mm long; *lemmas* 4–10 mm long, lanceolate, oblong, ovate or elliptic, membranous, chartaceous, coriaceous, sometimes indurate, 3–5 (–7)-veined, apex entire or awned, the awns up to 20 mm long; *paleas* 2-veined, keels scabrous. *Flowers* perfect; *lodicules* 2; *anthers* 1.3–4.6 mm long, 3; *ovary* glabrous. *Caryopses* 3–6 mm long, elliptic, glabrous.

Species

**Lolium apenninum* (De Not.) Ardenghi & Foggi, **L. arundinaceum* (Schreb.) Darbysh., **L. canariense* Steud., **L. font-queri* (St.-Yves) Banfi, Galasso, Foggi, Kopecký & Ardenghi, **L. edwardii* H. Scholz, Stierst. & Gaisb. **L. giganteum* (L.) Darbysh., **L. interruptum* (Desf.) Banfi, Galasso, Foggi, Kopecký & Ardenghi, **L. letourneuxianum* (St.-Yves) Banfi, Galasso, Foggi, Kopecký & Ardenghi, **L. loliaceum* (Bory & Chaub.) Hand.-Mazz., **L. lowei* Menezes, **L. mairei* (St.-Yves) Banfi, Galasso, Foggi, Kopecký & Ardenghi, **L. multiflorum* Lam., **L. perenne* L., **L. persicum* Boiss. & Hohen., **L. pratense* (Huds.) Darbysh., **L. remotum*, Schrank, **L. rigidum* Gaudin, **L. subulatum* Vis., **L. temulentum* L., **L. tuberosum* (Romero Zarco & Cabezudo) Banfi, Galasso, Foggi, Kopecký & Ardenghi.

Distribution

Europe, Asia, northern Africa (native); introduced in western hemisphere and Antartica.

Lolium simensis (Hochst. ex A.Rich.) P.M.Peterson, Romasch. & Soreng, **comb. nov.**

Bas.: *Festuca simensis* Hochst. ex A.Rich., Tent. Fl. Abyss. 2: 433. 1851 [1850].

Type: Ethiopia, Crescit in montibus simensibus, 1842, *G.W. Schimper 684* (isotypes: K000345291 [image!], MO-1742077 [image!]).

Munnikopoa Soreng, P.M.Peterson & Romasch., **gen. nov.**

Type. *Munnikopoa scabra* (Vahl) P.M.Peterson, Romasch. & Soreng,

(≡) *Festuca scabra* Vahl., Symb. Bot. 2: 21. 1791.

Description

Perennials tufted, with retrorsely strigose butt sheaths that are thickened and forming a tuberose base, persistent and investing base of culm with fibrous dead sheaths, basal innovations with short or elongated rhizomes. *Culms* 20–100 cm tall, erect. *Leaf sheaths* open for most of their length with retrorse velvet, silvery hairs, especially on lower portion; *ligules* 1.5–7 mm long, membranous, eciliate; *blades* 5–10 mm wide, flat, convolute. *Inflorescence* a contracted panicle 5–30 cm long, 1–3 cm wide, sometimes spike-like and interrupted below. *Spikelets* 7–15 mm long, 3–7-flowered, elliptic or oblong, laterally compressed; *rachilla* smooth, glabrous; *floret callus* smooth; *glumes* shorter than the spikelet, the lower 0.7–0.8 as long as the upper, chartaceous; *lower glumes* about 5 mm long, lanceolate, 1-veined, apex acute; *upper glumes* about 6 mm long,

lanceolate, 3-veined, apex acuminate; *lemmas* about 6 mm long, lanceolate, 5-veined, chartaceous, asperulous, apex entire, mucronate or short awned, the awns up to 1.2 mm long; *paleas* 2-veined, keels scaberulous. *Flowers* dioecious; *lodicules* 2; *anthers* 1.5–2 mm long, 3; *ovary* pubescent on apex.

Etymology

The name is derived from the Afrikaans common name, "Munnik fescue", which translates as monk fescue; and the species overall aspect resembles a *Poa*.

Distribution

Southern Africa.

****Munnikopoa scabra*** (Vahl) P.M.Peterson, Romasch. & Soreng, **comb. nov.**

Bas.: *Festuca scabra* Vahl, Symb. Bot. 2: 21. 1791.

Type: South Africa, Cape of Good Hope, *Blow s.n.* (holotype: C10001144 [image!]).

Pseudobromus K.Schum., Pflanzenw. Ost-Afrikas C: 108. 1895.

Type: *Pseudobromus silvaticus* K.Schum., Pflanzenw. Ost-Afrikas C: 108. 1895.

Description

Perennials tufted, sometimes with butt sheaths persistent and investing the base of culm with fibrous dead sheaths (*F. costata* var. *breviseta*), with short, knotty rhizomes (*P. engleri, P. africana*), elongated rhizomes (*F. longipes*, *F. mekiste*) or without rhizomes. *Culms* 30–200 cm tall, erect. *Leaf sheaths* glabrous, smooth, sometimes open for most of their length (*F. longipes*), sometimes with falcate auricles (*F. mekiste*); *ligules* 0.5–8 mm long, membranous, eciliate; *blades* 2–20 mm wide, flat, sometimes convolute (*F. killickii*), usually with cross venation (transverse veinlets) and flaccid, glabrous or scaberulous. *Inflorescence* 10–50 cm long, ovate, open, usually with spreading or ascending, flexuous primary branches, sometimes corymbose (F. longipes) or pyramidal (*F. killickii*). *Spikelets* 7–20 mm long, 1–6-flowered, lanceolate, oblong, sometimes elliptic, laterally compressed; *rachilla* glabrous; *floret callus* usually pubescent and obtuse; *glumes* shorter than the spikelet, the lower 0.7–0.9 as long as the upper, membranous or chartaceous; *lower glumes* 2–6.5 mm long, lanceolate, 1-veined, sometimes 3-veined (*F. longipes*); *upper glumes* 3–8 mm long, lanceolate, 3-veined, sometimes 5-veined (*P. breviligulatus*) or 1–3-veined (*F. killickii*); *lemmas* 5–10 mm long, elliptic or lanceolate, 5-veined or 3–5-veined, membranous or coriaceous, sometimes chartaceous (*F. killickii*), subapically awned, the awns 9–20 mm long, flexuous with a 2-fid, dentate apex or apex mucronate (*F. killickii, F. longipes*), sometimes with an entire apex (*F. longipes*); *paleas* 2-veined, keels scaberulous. *Flowers* perfect, sometimes dioecious (*F. killickii*); *lodicules* 2; *anthers* 3.5 mm long (*F. costata* var. *breviseta*), 3; *ovary* pubescent on apex or sometimes glabrous (*F. mekiste*). *Caryopses* hairy at apex or glabrous.

Species

**Pseudobromus africanus* (Hack.) Stapf, **P. breviligulatus* Stapf ex A.Camus [Madagasgar, see Schatz et al. 2024], **P. engleri* (Pilg.) Clayton (= *Pseudobromus brassii* C.E. Hubb.), *P. humbertianus* A.Camus [Madagasgar, see Schatz et al. 2024], **P. silvaticus* K.Schum., *P. tenuifolius* A.Camus, and four more (see below).

Distribution

Africa and Madagascar.

****Pseudobromus brevisetus*** (Nees) P.M.Peterson, Romasch. & Soreng, **comb. nov.**

Bas.: *Festuca costata* Nees var. *breviseta* Nees, Fl. Afr. Austral. Ill. 447. 1841.

Type: South Africa, Windvogelberg, in den Kränzen und an felsigen und steinigen Oerten auf dem Berg, 4000–5000 Fuss [Windvogelberg, in the wreaths and rocky and stony places on the mountain, 4000–5000 feet], Nov, *J.F. Drege s.n.* (W18890252203 [image!], lectotype designated here).

****Pseudobromus killickii*** (Kenn.-O'Byrne) P.M.Peterson, Romasch. & Soreng, **comb. nov.**

Bas.: *Festuca killickii* Kenn.-O'Byrne, Kew Bull. 16: 461. 1963.

Type: South Africa, Natal, Bergville, Cathedral Peak Forestry Station, 9000 ft, 17 Dec 1957, *D.J.B. Killick 2282* (holotype K000345248 [image!]; isotypes PRE0024502-0 [image!], SRGH0106267-0 [image!]).

****Pseudobromus longipes*** (Stapf) P.M.Peterson, Romasch. & Soreng, **comb. nov.**

Bas.: *Festuca longipes* Stapf, Fl. Cap. 7: 721–722. 1900.

Type: South Africa, Coast Region, on stony slopes near Grahamstown, *L. MacOwan 1323* (K000743002 [image!], lectotype designated here.

Pseudobromus mekiste (Clayton) P.M.Peterson, Romasch. & Soreng, **comb. nov.**

Bas.: *Festuca mekiste* Clayton, Kew Bull. 23: 293. 1969.

Type: Kenya, eastern slopes of Mount Elgon, in forest, fairly frequent, 9000 ft, 1 Dec 1962, *A. Bogdan 5390* (holotype K000345282 [image!]).

Valdesochloa P.M.Peterson, Romasch. & Soreng, **gen. nov.**

Type. *Valdesochloa lugens* (E.Fourn.) P.M.Peterson, Romasch. & Soreng

Description

Perennials tufted or geniculately ascending, innovations extravaginal or intravaginal, rhizomes short, if present. *Culms* 50–200 cm tall, erect to slightly geniculate at base, nodes glabrous, internodes glabrous or scaberulous. *Leaf sheaths* scaberulous; *ligules* 0.5–5.5 (–7) mm long, those of vegetative shoots usually less than 1.4 mm long, membranous; *blades* 3–7 mm wide, flat to convolute, scaberulous. *Inflorescence* a panicle 9–35 cm long, 5–15 cm wide, open, elliptic to ovate, erect to nodding. *Spikelets* 11–20 mm long, 3–7 (–8)-flowered, ovate to oblong, laterally compressed; *rachilla internodes* smooth or scaberulous; *glumes* shorter than the spikelet, the lower glume 0.5–0.6 as long as the upper glume, chartaceous or membranous; *floret callus* glabrous; *lower glumes* 2–7 (–8) mm long, subulate, 1-veined; *upper glumes* 4–10 mm long, lanceolate 1- or 3-veined; *lemmas* 8–16 mm long (7–9 mm long in *F. asperella* and *F. caldasii*; 9–11 mm long in *F. superba,* and *F. venezuelana*; 12–15.5 mm in *F. breviglumis* and *F. lugens*; 11–16 mm in *F. chiriquensis*), 3- or 5-veined, membranous, scaberulous, glabrous or puberulent, apex mucronate (0.4–0.8 mm long in *F. breviglumis* and *F. superba*) or 1-awned, the awns 1–15 mm long (1–5 mm long in *F. chiriquensis* and *F. lugens*; 2–8 mm long in *F. venezuelana* and *F. caldasii*; 10–15 mm long in *F. breviglumis*), entire or dentate; *paleas* 0.7 to as long as the lemma, 2-veined, keels scaberulous. *Flowers* perfect; *lodicules* 2; *anthers* 3–5.5 mm long, 3; *ovary* apex glabrous or hairy (*F. asperella, F. superba*). *Caryopses* glabrous or hairy (*F. superba*) at apex.

Etymology

The generic name honors Dr. Jesús Valdés-Reyna (1948–2024), an exemplary agrostologist, plant taxonomist, colleague, and friend (te extrañaremos amigo) who taught at the Universidad Autónoma Agraria Antonio Narro in Saltillo, Mexico for nearly 47 years.

Species

Seven (see below).

Distribution

North, central, and South America.

Valdesochloa asperella (E.B.Alexeev) P.M.Peterson, Romasch. & Soreng, **comb. nov.**

Bas.: *Festuca asperella* E.B. Alexeev, Bot. Zhurn. (Moscow & Leningrad) 66: 1496. 1981.

Type: Mexico, Mexico, along Hwy 95, south of Mexico City, just south of El Gordo, high mountain meadow area, 9000 ft, 21 Aug 1972, *Dziekanowski, Dunn & Bolingbroke 2022* (holotype US-2729388!; isotypes CHAPA0000009 [image!], MO128941 [image!]).

Valdesochloa breviglumis (Swallen) P.M.Peterson, Romasch. & Soreng, **comb. nov.**

Bas.: *Festuca breviglumis* Swallen, Contr. U.S. Natl. Herb. 29(9): 398. 1950.

Type: Costa Rica, Prov. San José, in dense oak and bamboo forest near Laguna de la Escuadra, NE of El Copey, 2000–2200 m, 16 Dec. 1925, *P.C. Standley 41998* (holotype US-1307123!).

(=) *Bromus cernuus* Swallen, Bol. Soc. Bot. México 23: 26–28, f. 1. 1958 [1959].

Type: Mexico, Jalisco, on steep mountain sides in pine forest, northern slopes of the Nevado de Colima, west of summit of the northern ridge, near junction of the old pack road to Zapotlan with Atenquique-Jazmin road, 2100–2200 m, 15 Oct 1952, *R. McVaugh 13525* (holotype US-2118494!; isotypes G00099282 [image!], K000433575 [image!], MEXU00114212 [image!], MICH1108611 [image!]).

Valdesochloa caldasii (Kunth) P.M.Peterson, Romasch. & Soreng, **comb. nov.**

Bas.: *Bromus caldasii* Kunth, Nov. Gen. Sp. (quarto ed.) 1:151. 1816.

Type: Ecuador, crescit locis altis regni Quitensis, prope Chillo, Conocoto et Sangolqui, *A.J.A. Humboldt &*

F.W.H.A. Bonpland s.n. (lectotype, designated by Stančík & Peterson, Contr. U.S. Natl. Herb. 56: 36. 2007: P00669421 [image!]; isolectotypes B, US-865519! fragm. ex P).

(≡) *Schedonorus caldasii* (Kunth) Roem. & Schult., Syst. Veg. 2: 709. 1819.

(≡) *Festuca quadridentata* var. *caldasii* (Kunth) St.-Yves, Candollea 3: 266. 1927.

****Valdesochloa chiriquensis*** (Swallen) P.M.Peterson, Romasch. & Soreng, **comb. nov.**

Bas.: *Festuca chiriquensis* Swallen, Ann. Missouri Bot. Gard. 30(2): 116. 1943.

Type: Panama, Chiriqui, Volcan de Chiriqui, open places in woods, 1300–1500 m, 29–30 Sep 1911, *A.S. Hitchcock 8197* (holotype US-1006331!).

****Valdesochloa lugens*** (E.Fourn.) P.M.Peterson, Romasch. & Soreng, **comb. nov.**

Bas.: *Uniola lugens* E. Fourn., Mexic. Pl. 2: 123. 1886.

Type: Mexico, Oaxaca, Cumbre de Estepa, Sep 1842, *F.M. Liebmann 502* [Lieb. Pl. Mex. 6247] (lectotype, designated by Gonzaléz-Ledesma: C10016959 [image!]; isolectotype C10016960 [image!]).

(≡) *Festuca lugens* (E.Fourn.) Hitchc. ex Hern.-Xol., Bol. Soc. Bot. México 23: 165. 1958.

****Valdesochloa superba*** (Parodi ex Türpe) P.M.Peterson, Romasch. & Soreng, **comb. nov.**

Bas.: *Festuca superba* Parodi ex Türpe, Darwiniana 15: 210. 1969.

Type: Argentina, Jujuy: Dpto. Capital: Termas de Reyes, 2000 m, 5 Feb 1943, *L.R. Parodi 14552* (BAA00002132 [image!], lectotype designated here; isolectotypes BAA00002133 [image!], US-1865220!).

****Valdesochloa venezuelana*** (Stančík) P.M.Peterson, Romasch. & Soreng, **comb. nov.**

Bas.: *Festuca venezuelana* Stančík, Darwiniana 41(1–4): 111–112, f. 15b–l. 2003.

Type: Venezuela, Táchira. Municipio La Grita, Páramo La Negra, cross of the roads to La Grita and Pogonero, 08°13'22"N 71°52'51"W, shrubby margin of the road with Asteraceae, Melastomataceae, *Cordia* sp., 2800 m, 11 Nov 2000, *D. Stančík 4262* (holotype PRC451115 [image!]; isotypes AAU, CAR, COL, W).

Xanthochloa (Krivot.) Tzvelev, Bot. Zhurn. 91(2): 275. 2006. *Festuca* sect. *Xanthochloa* Krivot. Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk SSSR 20: 64. 1960.

Type: *Xanthochloa karatavica* (Bunge) Tzvelev, Bot. Zhurn. (Moscow & Leningrad) 91(2): 275. 2006.

(≡) *Poa karatavica* Bunge, Beitr. Fl. Russl.: 349. 1852.

(≡) *Festuca karatavica* (Bunge) B.Fedtsch., Izv. Peterb. Bot. Sada 14(Suppl. 2): 86. 1915.

(≡) *Leucopoa karatavica* (Bunge) V.I.Krecz. & Bobrov., Fl. SSSR 2: 496. 1934.

(=) *Patzkea* G.H.Loos, Jahrb. Bochum. Bot. Vereins 1: 126. 2010.

Type: *Patzkea paniculata* (L.) G.H.Loos, Jahrb. Bochum. Bot. Vereins 1: 126. 2010.

(≡) *Anthoxanthum paniculatum* L., Sp. Pl.: 28. 1753.

(≡) *Festuca paniculata* (L.) Schinz & Thell., Vierteljahrsschr. Naturf. Ges. Zürich 58: 40. 1913.

Description

Perennials tufted, butt sheaths thickened and sometimes forming a tuberose base (*P. durandoi, P. paniculata*), persistent and investing base of culm with fibrous dead sheaths, basal innovations intravaginal, sometimes extravaginal. *Culms* 50–140 cm tall, erect. *Leaf sheaths* glabrous, sometimes open for most of their length and antrorsely scabrous along margins (*F. sclerophylla*); *ligules* 1–8 mm long, membranous, eciliate; *blades* 0.4–2 mm wide, filiform, conduplicate or convolute (*P. durandoi* and *P. paniculata*) or 2–10 mm wide, flat or convolute (*X. karatavica* and *F. sclerophylla*), glabrous or marginally scabrous. *Inflorescence* 8–30 cm long, oblong, dense, narrow, sometimes open (*F. sclerophylla*). *Spikelets* 7–14 mm long, 3–7-flowered, oblong, lanceolate (*P. durandoi*) or obovate (*P. paniculata*), laterally compressed; *rachilla* glabrous; *glumes* shorter than the spikelet, the lower 0.7–0.9 as long as the upper, usually hyaline; *lower glumes* 3.5–6 mm long, lanceolate, 1-veined or unveined (*X. karatovica*); *upper glumes* 4–7.5 mm long, oblong (*P. durandoi* and

P. paniculata) or ovate (*F. sclerophylla* and *X. karatavica*), hyaline or membranous to scarious, 3-veined; *lemmas* 6–11 mm long, lanceolate, 5-veined, chartaceous, sometimes membranous (*X. karatavica*), apex entire or mucronate, scaberulous; *paleas* 2-veined, keels scaberulous. *Flowers* perfect, sometimes dioecious (*F. sclerophylla*); *lodicules* 2; *anthers* 2.5–4.5 mm long, 3; *ovary* pubescent on apex, sometimes glabrous (*X. karatavica*). *Caryopses* glabrous, sometimes hairy at apex (*F. sclerophylla*).

Species

**Xanthochloa griffthiana* (St.-Ives) Tzlelev, *X. karatavica* (Bunge) Tzvelev, and five more (see below).

Distribution

Europe, temperate Asia (western and Caucasus), northern Africa (*P. paniculata*).

****Xanthochloa baetica*** (Hack.) P.M.Peterson, Romasch. & Soreng, **comb. nov.**

Bas.: *Festuca spadicea* var. *baetica* Hack., Monogr. Festuc. Eur. 167. 1882.

Type: Spain, Andalucía, Prope Algeciras in Sra. de Palma, 19 Aug 1876, *E. Hackel s.n.* (lectotype, designated by De la Fuente et al. in Candollea 43(2): 517. 1988: W19160013770 [image!]).

(≡) *Festuca baetica* (Hack.) Richt., Pl. Eur. 1: 103. 1890.

(≡) *Festuca paniculata* subsp. *baetica* (Hack.) Markgr.-Dann., Bot. J. Linn. Soc. 76(4): 326. 1978.

(≡) *Patzkea paniculata* subsp. *baetica* (Hack.) H.Scholz, Willdenowia 40(2): 200. 2010.

****Xanthochloa durandoi*** (Clausen) P.M.Peterson, Romasch. & Soreng, **comb. nov.**

Bas.: *Festuca durandoi* Clausen, Annot. Fl. France Allemagne 163. 1859.

Type: Algeria, Recolté sur le Zaccar, May 1858, *M. Lirou* s.n. (lectotype, designated by Cebolla Lozano et al. in Fontqueria 48: 82. 1997): P00434516 [image!] ex herb Cosson).

(≡) *Festuca spadicea* var. *durandoi* (Clauson) Hack., Monogr. Festuc. Eur. 167. 1882.

(≡) *Festuca spadicea* subsp. *durandoi* (Clauson) Trab. Fl. Alger 217. 1895.

(≡) *Patzkea durandoi* G.H.Loos, Jahrb. Bochum. Bot. Vereins 1: 126. 2010.

Notes

The specimen on the right side of the sheet.

****Xanthochloa paniculata*** (L.) P.M.Peterson, Romasch. & Soreng, **comb. nov.**

Bas.: *Anthoxanthum paniculatum* L., Sp. Pl. 28. 1753.

Type: France, Dei dicto Gallo Provincia, 1600–1625, *J. Burser I: 46* (lectotype, designated by W.T. Stearn, in An introduction to the Species Plantarum and cognate botanical works of Carl Linnaeus 1: 128. (XIII). 1957, C. von Linnaeus Sp. Pl. Facsimile. Ray Society, London: UPS V-172813).

(≡) *Festuca paniculata* (L.) Schinz & Thell. Vierteljahrsschr. Naturf. Ges. Zürich 58: 40. 1913.

(≡) *Patzkea paniculata* (L.) G.H.Loos, Jahrb. Bochum. Bot. Vereins 1: 126. 2010.

****Xanthochloa sclerophylla*** (Boiss. ex Bisch.) P.M.Peterson, Romasch. & Soreng, **comb. nov.**

Bas.: *Festuca sclerophylla* Boiss. ex Bisch., Del. Sem. (Heidelberg) 1849: 4. 1849.

Type: Iran, in locis schistosis m. Elbrus [Elburz] pr. Derbend, 5 Jun 1843, *C.G.T. Kotschy 245* (isolectotype designated by Bor in Gramineae. Fl. Iranica 70/30: 73. 1970: W0033063 [image!]).

Xanthochloa spadicea (L.) P.M.Peterson, Romasch. & Soreng, **comb. nov.**

Bas.: *Festuca spadicea* L., Syst. Nat., ed. 12, 2: 732. 1767.
Type: France, Habitat Monspelii, *A. Gouan s.n.* (lectotype designated by Kerguélen & Plonka, Bull. Soc. Bot. Centre-Ouest 10: 243. 1989: LINN-HL92-37 [image!]).

(≡) *Schedonorus spadiceus* (L.) Roem. & Schult., Syst. Veg. 2: 700. 1817.

(≡) *Festuca paniculata* subsp. *spadicea* (L.) Litard., Candollea 10: 111. 1945.

(≡) *Patzkea spadicea* (L.) G.H.Loos, Jahrb. Bochum. Bot. Vereins 1: 126. 2010.

(≡) *Patzkea paniculata* subsp. *spadicea* (L.) B.Bock, Bull. Soc. Bot. Centre-Ouest 42: 274. 2012.

Provisional key to the genera in *Festuca* subtr. Loliinae

1 Plants annual 2

- Plants perennial..... 4

2 Lower glume absent; inflorescence a spike with sessile-inserted spikelets oriented radially to the main axis ..... ***Lolium*** p.p.

- Lower glume present; inflorescence a panicle, spike-like or a spike..... 3

3 Lemma surface tuberculate, the apex unawned; leaf blades broad and flat..... ***Castellia***

- Lemma surface not tuberculate, apex often awned; leaf blades usually narrow..... ***Festuca*** p.p. (*Vulpia*)

4 Lower glume absent; inflorescence a spike ..... ***Lolium*** p.p.

- Lower glume present; inflorescence a panicle 5

5 Leaf blades with lanceolate or crescent shaped or falcate auricles at the base..... ***Lolium*** p.p. (*Schedonorus*)

- Leaf blades without falcate auricles, sometimes with auriculate extensions arising from the upper sheaths..... 6

6 Glumes coriaceous and firm, membranous only at the margins; leaf blades usually narrow and convolute, mostly ≤2 mm wide when expanded; ligules <1mm long, apex truncate; anthers <1 mm long; flowers bisexual; plants mostly ≤50 cm tall; plants cosmopolitan ..... ***Festuca*** p.p. (NLC)

- Glumes membranous to chartaceous, rarely coriaceous, usually entirely membranous; leaf blades flat, broad, mostly >2 mm wide, rarely narrow and convolute; ligules sometimes > 1mm long, apex acute, obtuse or truncate; flowers unisexual or bisexual; plants >50 cm tall..... 7

7 Ligules 2–5 mm long; lemmas awnless; flowers bisexual; panicles lax with thin branches; plants 50–150 cm tall; plants of Eurasia or Australia ..... ***Drymochloa***

- Ligules of various lengths; lemmas awned or awnless; flowers unisexual or bisexual; panicles lax to erect, often with thicker branches; plants not confined to Eurasia..... 8

8 Leaf blades broad and flat with prominent cross venation or transverse veinlets; plants from Africa ..... ***Pseudobromus*** p.p.

- Leaf blades broad and flat or narrower without prominent cross venation or transverse veinlets; plants not restricted to Africa 9

9 Culms with bulbous or tuberous bases; plants from Africa and Eurasia..... 10

- Culms without bulbous or tuberous bases; plants not confined to Eurasia..... 13

10 Lower sheath bases with retrorse velvet silver hairs; ligules 2–5 mm long; panicles contracted, branches smooth or nearly so; lemmas asperulous, apex entire, mucronate or short awned, the awns up to 1.2 mm long; plants of southern Africa highlands..... ***Munnikopoa***

- Lower sheath bases lacking retrorse velvet silver hairs; lemmas mostly smooth, mucronate or unawned; plants of the Mediterranean or central Asia..... 11

11 Culms 20–45 cm tall; plants dioecious..... ***Leucopoa***

- Culms 50–140 cm tall; plants hermaphroditic with perfect flowers, rarely dioecious (*Xanthochloa sclerophylla* 12

12 Ovary apex densely strigose with stiff hairs; leaf blades generally flat..... ***Locajonoa***

- Ovary apex pubescent or glabrous but not with densely strigose hairs; leaf blades filiform, conduplicate or convolute..... ***Xanthochloa***

13 Plants of Mexico, Central America, and South America (found in humid ravines, cloud forests, or associated with oak woodlands..... ***Valdesochloa***

- Plants of temperate North America (*Hesperochloa amplissima* ranges from Mexico to Colombia), temperate Eurasia, Hawaii, and southern South America ..... ***Hesperochloa***

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APPENDIX 1

Taxon voucher (collector, number, and where the specimen is housed), country of origin, and GenBank accession for DNA ITS region; **bold** indicates new accession; asterisk (*) indicates GenBank data.

	Taxa	Voucher	Country	ITS
1	*Avenella flexuosa* (L.) Drejer	Peterson 24054, Soreng, Romaschenko & Abeid (US)	Tanzania, Njombe	**PV126333**
2	*Drymochloa donax* (Lowe) H.Scholz & Foggi	Sequeira 4515 & Catalán (UZ)	Portugal, Madeira	EF584935*
3	*Drymochloa drymeja* (Mert. & W.D.J.Koch) Holub	BS3675	Hungary	HM453181*
4	*Drymochloa lasto* (Boiss.) Holub	BS3748	Spain, Los Barrios	HM453180*
5	*Drymochloa lasto* (Boiss.) Holub	UZ 29.08 (UZ)	Spain, Cadiz	MT145291*
6	*Festuca abyssinica* Hochst. ex A.Rich.	Peterson 24019, Soreng, Romaschenko & Abeid (US)	Tanzania, Njombe	**PV126334**
7	*Festuca alatavica* (Hack. ex St.-Yves) Roshev.	Soreng 7678, Johnson, Shuvalov, Chapurin, Samsaliev & Samsaliev (US)	Kyrgyzstan, Naryn	**PV126335**
8	*Festuca aloha* Catalán, Soreng & P.M. Peterson	Wood 1701 & Perlman (US)	USA, Hawaii	GQ162205*
9	*Festuca altaica* Trin.	Soreng FE-426 & Olonova (US)	Russia, Kamchatka	**PV126336**
10	*Festuca altissima* All.	Catalán 1.98 (UZ)	France, Aspe	AF303411*
11	*Festuca amplissima* Rupr.	Peterson 21097 & Saarela (US)	Mexico, Nuevo Leon	MT145278*
12	*Festuca argentina* (Speg.) Parodi	Catalán 0210 (UZ)	Argentina, Rio Negro	OP120917*
13	*Festuca argentina* (Speg.) Parodi	Peterson 17158, Soreng, Refulio-Rodríguez & Belgrano (US)	Argentina, Santa Cruz	**PV126337**
14	*Festuca arundinacea* var. *glaucescens* Boiss.	GenBank (UZ)	Spain, Segovia	AF532950*
15	*Festuca arundinacea* subsp. *cirtensis* (St.-Yves) Gamisans	GenBank	Morocco, Agadir Gouj	HM453189*
16	*Festuca asperella* E.B.Alexeev	Trott 142, Dziekanowski, Case, Dunn, Hess & Thurm (MO)	Mexico	OP120918*
17	*Festuca baetica* (Hack.) Richt.	Rivas s.n. (UAM)	Spain, Cadiz	AF303405*

	Taxa	Voucher	Country	ITS
18	*Festuca bajacalifornica*na Gonz.-Led. & S.D. Koch	Peterson 5287, Annable, Thorne & Noyes (US)	Mexico, Baja California Norte	KY368814*
19	*Festuca breviglumis* Swallen	Peterson 21366, Saarela & Flores Villegas (US)	Mexico, Mexico	OP120919*
20	*Festuca brevissima* Jurtzev	Soreng 6170 & Soreng (US)	USA, Alaska	**PV126338**
21	*Festuca bromoides* L.	Banks 57 (US)	USA, Alabama	**PV126339**
22	*Festuca caldasii* (Kunth) Kunth	HUTPL 14055 (HUTPL)	Ecuador, Catamayo	MT145280*
23	*Festuca californica* Vasey	Hoover 4940 (US)	USA, California	**PV126340**
24	*Festuca campestris* Rydb.	Lackschewitz 7288 (US)	USA, Montana	**PV126341**
25	*Festuca caprina* var. *macra* Stapf	Sylvester 3406, Soreng & Sylvester (US)	South Africa, Kwazulu-Natal	**PV126342**
26	*Festuca chiriquensis* Swallen	Gamboa Romero 830, Alfaro & Picado (MO)	Costa Rica, Cartago	OP120920*
27	*Festuca costata* Nees	Peterson 24025, Soreng, Romaschenko & Abeid (US)	Tanzania, Njombe	**PV126343**
28	*Festuca dasyclada* Hack. ex Beal	Irvine 193 & Chichester (US)	USA, Colorado	**PV126344**
29	*Festuca dichoclada* Pilg.	Peterson 14056 & Tovar (US)	Peru, Junín	**PV126345**
30	*Festuca dichoclada* Pilg.	Peterson 20603, Soreng & Romashchenko (US)	Peru, Cusco	OP120921*
31	*Festuca dimorpha* Guss.	Coste s.n. (US)	France, St Etienne de Tinée	**PV126346**
32	*Festuca drakensbergensis* Sylvester, Soreng & M.Sylvester	Sylvester 3660, Soreng & Sylvester (US)	South Africa, Lesotho	**PV126347**
33	*Festuca elmeri* Scribn. & Merr.	Howell 1534/24310 (US)	USA, California	**PV126348**
34	*Festuca extremiorientalis* Ohwi	Soreng FE-040 & Olonova (US)	Russia, Primorsky	**PV126349**
35	*Festuca hallii* (Vasey) Piper	Stevens 2189 (US)	USA, North Dakota	**PV126350**
36	*Festuca hallii* (Vasey) Piper	Weber 9694 & Pickford (US)	USA, Colorado	**PV126351**
37	*Festuca heterophylla* Lam.	Holmgren s.n. (US)	Sweden, Blekinge	**PV126352**
38	*Festuca horridula* Pilg.	Tovar 6607 & Soplín	Peru, Junín	OP120923*
39	*Festuca hubsugulica* Krivot.	Pezhemskyi 99 III (LE)	Russia, Eastern Sayan	KY368809*
40	*Festuca idahoensis Elmer*	Piemeisel 10 (US)	USA, Idaho	**PV126353**
41	*Festuca incurva* (Gouan) Gutermann	Iter Mediterraneum IV Cyprus 767 (MA)	Cyprus	**PV126354**
42	*Festuca killickii* Kenn.-O'Byrne	Catalán SA041 & Pimentel (JACA)	South Africa, KwaZulu Natal	KY368803*
43	*Festuca komarovii* Krivot.	Malyshev s.n. (LE)	Russia, Buryatia	KY368807*
44	*Festuca longipes* Stapf	Soreng ZA-09 & Sylvester (US)	South Africa, Orange Free State	**PV126355**
45	*Festuca lugens* (E.Fourn.) Hitchc. ex Hern.-Xol.	Peterson 17573 & Catalán (US)	Mexico, Chihuahua	KY368795*
46	*Festuca megalura* Nutt.	Peterson 13791 & Refulio-Rodríguez (US)	Peru, Ancash	**PV126356**
47	*Festuca mekiste* Clayton	Carvalho 4521	Kenya	ON243855
48	*Festuca microstachys* var. *ciliata* A. Gray ex Beal	Sharsmith 3528 (US)	USA, California	**PV126357**
49	*Festuca modesta* Pilg.	Soreng, Peterson & Sun (US)	China, Yunnan	EF584953*
50	*Festuca molokaiensis* Soreng, P.M.Peterson & Catalán	Oppenheimer H40704, Perlman & Tangalin (BISH)	USA, Hawaii	MT145294*
51	*Festuca muelleri* Vickery	Burcham 93 (US)	Australia, Victoria	**PV126358**
52	*Festuca muelleri* Vickery	Walsh 6797 & Coates (MEL)	Australia, Victoria	KJ598993*
53	*Festuca myuros* L.	Peterson 18750, Saarela & Smith (US)	Canada, British Columbia	**PV126359**
54	*Festuca nitidula* Stapf ex Hook. f.	sine col.	China	KY999975*
55	*Festuca octoflora* Walter	Freeman 54128 (US)	USA, North Carolina	**PV126360**
56	*Festuca ovina* L.	Mueller 6879 (UZ)	Spain	JQ972950*
57	*Festuca parvigluma* Steud.	Soreng 5576, Peterson & Sun Hang (US)	China, Xizang	EF584960*
58	*Festuca patula* Desf.	Catalán UZ39.17 (UZ)	Morocco	MT145306*
59	*Festuca patula* Desf.	Catalán UZ95.2000, Torrecilla & López Rodríguez (UZ)	Spain, Cádiz	AF538362*

	Taxa	Voucher	Country	ITS
60	*Festuca pseudoeskia* Boiss.	Cebolla s.n. & Rivas (UAM)	Spain, Granada	AF303417*
61	*Festuca pulchella* subsp. *pulchella* Schrad.	Muller 7807 (UZ)	Switzerland, Bern	AF519980*
62	*Festuca pulchella* subsp. *jurana* (Gren.) Markgr.-Dann.	Muller 8421 (UZ)	Italy, Trento	AF519981*
63	*Festuca quadridentata* Kunth	Acosta-Solis 7581 (US)	Ecuador, Chimborazo	MT145303*
64	*Festuca roemeri* (Pavlick) E.B.Alexeev	Swallen 5985 (US)	USA, Oregon	**PV126362**
65	*Festuca rubra* L.	Peterson 18424, Saarela & Smith (US)	Canada, Alberta	**PV126363**
66	*Festuca salzmannii* (Boiss.) Boiss. ex Coss.	Catalán 111.07 (UZ)	Spain	JQ972946*
67	*Festuca saximontana* Rydb.	Peterson 18349, Saarela & Smith (US)	Canada, Manitoba	**PV126364**
68	*Festuca scabra* Vahl	Hoener 1923 (US)	South Africa, Lesotho	**PV126365**
69	*Festuca scabra* Vahl	Sylvester 3456, Soreng & Sylvester (US)	South Africa, Eastern Cape	**PV126366**
70	*Festuca scabra* Vahl	Sylvester 3532, Soreng & Sylvester (US)	South Africa, Lesotho	**PV126367**
71	*Festuca scariosa* (Lag.) Asch. & Graebn.	Cebolla s.n. & Rivas (UAM)	Spain, Granada	AF303408*
72	*Festuca schimperiana* A.Rich.	Peterson 24362, Soreng & Romaschenko (US)	Tanzania, Kilimanjaro	**PV126368**
73	*Festuca sciurea* Nutt.	Hermann 4437 (US)	USA, New Jersey	**PV126369**
74	*Festuca sclerophylla* Boiss. & Hohen.	Rechinger 5987 & Rechinger (US)	Iran, Shahrud-Bustam	**PV126370**
75	*Festuca simensis* Hochst. ex A.Rich.	Namaganda 204K (MHU)	Uganda, Uchuya	GU573752*
76	*Festuca sinensis* Keng ex E.B.Alexeev	sine col.	China	KY999957*
77	*Festuca sororia* Piper	Darrow 3185 & Phillips (US)	USA, Arizona	**PV126371**
78	*Festuca sororia* Piper	Makings 2474 & Olsen (US)	USA, New Mexico	**PV126372**
79	*Festuca spectabilis* Jan	Catalán s.n. (UZ)	Bosnia and Herzegovina,	MT145304*
80	*Festuca subulata* Trin.	Ahart 8950 (US)	USA, California	**PV126373**
81	*Festuca subuliflora* Scribn.	Baker 156 & Ruhle (US)	USA, Oregon	**PV126374**
82	*Festuca superba* Parodi ex Türpe	Catalán 356.08 (UZ)	Argentina, Jujuy	MT145305*
83	*Festuca valdesii* Gonz.-Led. & S.D.Koch	Peterson 18796 & Valdes-Reyna (US)	Mexico, Coahuila	**PV126375**
84	*Festuca valdesii* Gonz.-Led. & S.D.Koch	Peterson 21456, Saarela & Stancik (US)	Mexico, Coahuila	OP120925*
85	*Festuca valesiaca* Schleich. ex Gaudin	Soreng 7896, Johnson, Johnson, Dzyubenko, Dzyubenko & Belous (US)	Russia, Stavropol	**PV126376**
86	*Festuca venezuelana* Stancik	Stancik 4262 (AAU)	Venezuela, Tachira	OP120926*
87	*Festuca washingtonica* E.B.Alexeev	Bjork CCDB-24911-F08	USA, Washington	MG216346*
88	*Helictochloa agropyroides* (Boiss.) Romero Zarco	Medina 4050, Aedo, Cabezas, Calvo, Castroviejo, Constantidinis, Gonzalo, Güemes, Herrero, Karidas, Navarro, Pedrol, Prunell, Quintanar, Rico & Rodríguez Gracia (MA)	Greece, Peloponnissos	**PV126377**
89	*Hesperochloa kingii* (S.Watson) Rydb.	Quibell 149	USA, California	OP120924*
90	*Hesperochloa kingii* (S.Watson) Rydb.	Terrell 4384 & Hatch (US)	USA, Utah	**PV126378**
91	*Leucopoa albida* (Turcz. ex Trin.) V.I.Krecz. & Bobrov	Kamelin 1171 et al. (LE)	Mongolia, Eastern aimak	KY368808*
92	*Leucopoa calabrica* (Huter, Porta & Rigo ex Hack.) H.Scholz & Foggi	Muller 10838	Italy, Calabria	KY368798*
93	*Locajonoa coerulescens* (Desf.) Soreng	Catalán UZ19.08 (UZ)	Spain	JQ972941*
94	*Locajonoa coerulescens* (Desf.) Soreng	Soderstrom 1432 (US)	Tunisia, Tunis	**PV126379**
95	*Lolium apenninum* (De Not.) Ardenghi & Foggi	Muller 7965 (UZ)	Switzerland, Valais	AF548028*
96	*Lolium arundinaceum* (Schreb.) Darbysh.	GenBank	Mediterranean	HM453186*
97	*Lolium arundinaceum* subsp. *corsicum* (Hack. ex Barbey) J.-M.Tison	Inda s.n. (UZ)	France, Corsica	EF379052*
98	*Lolium atlantigenum* (St.-Yves) Banfi, Galassos, Foggi, Kapecký & Ardenghi	GenBank		HM453188*
99	*Lolium canariense* Steud.	Santos 13.3.02 (UZ)	Spain, Tenerife	EF379062*
100	*Lolium edwardii* H.Scholz, Stierst. & Gaisb.	Scholz Berlin 24-3 (DNA)	Spain, Canarias	EF379066*

	Taxa	Voucher	Country	ITS
101	*Lolium font-queri* Banfi, Galasso, Foggi, Kopecký & Ardenghi	Catalán 1.97 (UZ)	Morocco, Rif Mountains	AF303404*
102	*Lolium giganteum* (L.) Darbysh.	Catalán 1331.88 (UZ)	Spain, Navarra	AF303416*
103	*Lolium interruptum* (Desf.) Banfi, Galasso, Foggi, Kopecký & Ardenghi	GenBank	Spain, Aoiz	HM453192*
104	*Lolium letourneuxianum* (St.-Yves) Banfi, Galasso, Foggi, Kopecký & Ardenghi	GenBank		AJ240156*
105	*Lolium loliaceum* (Bory & Chaub.) Hand.-Mazz.	Whinray 829 (MEL)	Australia, Tasmania	KJ598997*
106	*Lolium lowei* Menezes	MADS 06842 (MADS)	Portugal, Madeira	EF379068*
107	*Lolium mairei* (St.-Yves) Banfi, Galasso, Foggi, Kopecký & Ardenghi	Rivas 4064 (UAM)	Morocco, Marrakech	AF303424*
108	*Lolium multiflorum* Lam.	GenBank		HM453190*
109	*Lolium perenne* L.	Leicester University Herbarium s.n. (LEI)	United Kingdom,	AF303401*
110	*Lolium persicum* Boiss. & Hohen.	USDA Pullman PI 3174.50 88i	Afghanistan, Tarbulock	EF379076*
111	*Lolium pratense* (Huds.) Darbysh.	Soreng 6025 & Soreng (US)	USA, Alaska	AF532948*
112	*Lolium remotum* Schrank	USDA Pullman PI 233613	Sweden	EF379080*
113	*Lolium rigidum* Gaudin	USDA Pullman PI 545604 90i	Turkey, Saparozu	EF379081*
114	*Lolium subulatum* Vis.	USDA Pullman PI 197310 82i	Argentina	AF171165*
115	*Lolium temulentum* L.	GenBank		HM453179*
116	*Lolium tuberosum* (Romero Zarco & Cabezudo) Banfi, Galasso, Foggi, Kopecký & Ardenghi	Catalán 87.07 (UZ)	Spain	JQ972944*
117	*Micropyrum patens* (Brot.) Rothm. ex Pilg.	Lopez Rodrıguez 01194 (UZ)	Spain, Madrid	AF478495*
118	*Patzkea durandoi* (Clauson) G.H.Loos	Lopez Rodrıguez 6-6-00 (UZ)	Spain, Segovia	AF543514*
119	*Patzkea durandoi* (Clauson) G.H.Loos	sine col. (UZ)	Portugal, Serra Arga Alto do Espinheiro	MT145283*
120	*Patzkea paniculata* (L.) G.H.Loos	Catalán 40.07 (UZ)	Spain, Caceres	MT145297*
121	*Patkea paniculata* (L.) G.H.Loos	Alarcón 231, Aedo, Aizpuru, Aldasoro, Castroviejo, Valdecasas, Güemes, Herrero, Navarro, Pedrol, Prunell, Quintanar, Rico, Rodríguez Garcia & Vladimirov (MA)	Bulgaria, Sofía	**PV126380**
122	*Peyritschia erectifolia* (Hitchc.) P.M.Peterson, Soreng, Romasch. & Barberá	Peterson 19109 & Sánchez Alvarado (US)	Mexico, Jalisco	MK695723
123	*Poa billardierei* St.-Yves	Walsh 5678& Smith (MEL)	Australia, Victoria	AY524824*
124	*Pseudobromus africanus* (Hack.) Stapf	DeWinter 104 (US)	South Africa, Limpopo	KX873146*
125	*Pseudobromus africanus* (Hack.) Stapf	Namaganda 190 (MHU)	Uganda, Gahinga	MT145277*
126	*Pseudobromus breviligulatus* Stapf ex A.Camus	Vorontsova F1221	Madagascar	KY368806*
127	*Pseudobromus engleri* (Pilg.) Clayton	Namaganda 1739	Kenya	KY368802*
128	*Pseudobromus silvaticus* K.Schum.	Peterson 24392, Soreng & Romaschenko (US)	Tanzania, Morogoro	**PV126381**
129	*Pseudobromus silvaticus* K.Schum.	Renvoize 1900 & Abdallah (US)	Tanzania, Iringa, T7	**PV126382**
130	*Xanthochloa griffithiana* (Bunge) Tzvelev	Furse 8489 (LE)	Afghanistan, Hajigak pass	KY368813*

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Chamaegastrodia reiekensis: A new holomycotrophic orchid from Mizoram, Northeast India

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Abstract. *Chamaegastrodia reiekensis*, a holomycotrophic orchid from Northeast India (Mizoram) is described and illustrated as a new species. It is compared with its closely allied species *Chamaegastrodia guidongensis*, which although similar in morphology and mycoheterotrophic nature can be distinguished by the presence of slender rhizome, compact sheathing scales, floral bracts equalling or exceeding the ovary in length, larger sepals and petals with more dilated hypochile and distinctly sinuate mesochile margin. A key to species for the genus *Chamaegastrodia* is also incorporated. The conservation status of the newly described species is also provisionally assessed here as Critically Endangered (CR) according to International Union for Conservation of Nature (IUCN) Red List Categories and Criteria.

Keywords: *Chamaegastrodia reiekensis, Chamaegastrodia guidongensis,* mycoheterotrophic, Indo-Burma Hotspot, taxonomy.

INTRODUCTION

The genus *Chamaegastrodia* Makino & F.Maek. (Maekawa 1935) comprises terrestrial holomycotrophic orchids which are easily overlooked due to their inconspicuous size and lack of leaves. They are distributed from the Eastern Himalayas to South Central China, Japan, Korea, Myanmar, Nepal, Thailand and Vietnam (Govaerts et al. 2022). There are seven species reported worldwide namely, *Chamaegastrodia guidongensis* L.Wu, H.Z.Tian & C.Z.Huang (Qu et al. 2022), *C. asraoa* (J.Joseph & Abbar.) Seidenf. & A.N.Rao (Seidenfaden 1994), C. *inverta* (W.W.Sm.) Seidenf. (Seidenfaden 1994), *C. nanlingensis* H.Z.Tian & F.W.Xing (Tian and Xing 2008), *C. poilanei* (Gagnep.) Seidenf. & A.N.Rao (Seidenfaden 1994), *C. shikokiana* Makino & F.Maek. (Maekawa 1935) and *C. vaginata* (Hook.f.) Seidenf. (Seidenfaden 1994). The genus shares a close relationship with *Odontochilus* as per molecular studies by Li et al. (2016), but differs primarily in the shape and posi-

tion of its column wings. Several researchers have previously classified certain *Chamaegastrodia* species under *Odontochilus* (Ormerod 2002; Ormerod and Cribb 2003; Chen et al. 2009 a, b; Hsu and Chung 2009; Govaerts et al. 2022). A precise demarcation between the genus *Chamaegastrodia* and *Odontochilus* is still lacking and a comprehensive molecular study to confirm the taxonomic position of these taxa has been recommended (Tiwari et al. 2021). In the present study, we confirm seven species under *Chamaegastrodia* recorded worldwide after critically analysing the literature (Liu 2018; Tiwari et al. 2021, Qu et al. 2022). Among them, four species, namely, *C. asraoa*, *C. poilanei*, *C. shikokiana* and *C. vaginata* have been documented from India. They are predominantly found in northeastern states of India, particularly in Arunachal Pradesh and Meghalaya. The majority of these plants occur at elevations ranging from 500 to 1500 meters, with *C. shikokiana* being found at the lowest elevation (Jalal and Jayanthi 2013). With the discovery of the newly described taxa, the distribution of the genus *Chamaegastrodia* is expanded to Mizoram, which is another Northeast Indian state.

Mizoram possesses a distinctive topography and climatic conditions, with largely unexplored terrain that supports a rich diversity of orchid species. About 74 genera of orchids, with around 273 species have been identified so far from the state (Singh et al. 1990; Rao 2007; Odyuo and Tham 2008; Zote et al. 2009, 2011; Kumar and Singh 2012; Roy et al. 2012). However, the presence of *Chamaegastrodia* has not been reported until now and is here documented for the first time from Mizoram. In the ongoing exploration of Mizoram's flora, recent expeditions to Reiek Peak have revealed a previously unknown member of the *Chamaegastrodia* genus. This discovery not only enhances our comprehension of *Chamaegastrodia* as a whole but also prompts a re-evaluation of our broader understanding of biodiversity patterns and ecological interactions within the Reiek Peak, as the entire state is a part of Indo-Burma biodiversity hotspot. Despite the morphological resemblance of the collected specimen to other members of the genus, a critical analysis of morphological characters, relevant literature, and herbarium specimens from various collections indicates that it represents a new species of *Chamaegastrodia*, which is described here for the first time.

MATERIALS AND METHODS

Morphological characters and measurements were recorded from living samples gathered at the type locality of Mizoram during September 2023 to October 2024. To ensure the novelty of the species, relevant literature (Chen et al. 2009 a,b; Jalal and Jayanthi 2013; Bhattacharjee and Chowdhery 2018; Tiwari et al. 2021; Govaerts et al. 2022; Qu et al. 2022) was critically analysed along with consultation of several herbaria and virtual repositories (ARUN, ASSAM, CAL, K). The description of the new species adheres to the terminology provided by Beentje (2016), ensuring consistency and accuracy in the taxonomic description. The assessment of the conservation status was conducted following the IUCN Red List Categories and Criteria (2022), ensuring a standardized approach to evaluate the conservation needs of the species. Images of different parts of the plants were captured using a digital camera (Sony DSC–W610, Tokyo, Japan) and a BT-E digital microscope (Cilika, Thane, India).

Genomic DNA was extracted from the fresh tissue sample of the newly described *Chamaegastrodia* using the CTAB method (Doyle and Doyle 1987). PCR amplification of *matK* gene was performed using universal pair of primer (F- CGTACAGTACTTTTGTGTTTACGAG; R- ACCCAGTCCATCTGGAAATCTTGGTTC). The PCR product was purified and sequencing was done using Sanger sequencing method. The consensus and annotated *matK* sequence was deposited in the GenBank of National Centre for Biotechnology Information (NCBI) with accession No. PP873640. Phylogenetic tree was constructed in MEGA 12 (Kumar et al. 2024) to reveal evolutionary relationship of the newly described species, *Chamaegastrodia reiekensis* with other members of Orchidaceae. Twenty five *mat*K sequences of eight genera, *Anoectochilus* (2), *Chamaegastrodia* (6), *Dossinia* (3), *Goodyera* (4), *Hetaeria* (3), *Ludicia* (3), *Macodes* (1) and *Odontochilus* (3) were obtained from GenBank database and used in the phylogenetic analyses. *Vanilla pilifera* was included as an outgroup species to properly root the tree and determine the evolutionary relationships among these Orchidaceae members. *C. guidongensis* was not included in the phylogenetic analysis since *mat*K sequence of the species was not available in the GenBank (NCBI) database.

TAXONOMIC TREATMENT

Chamaegastrodia reiekensis Tlanhlui, S.D.Khomdram & S.D.Yumkham, **sp. nov.** (Figures 1, 2, 3)

Type: India, Mizoram, Mamit District, Reiek Tlang, 23.687007 N 92.606352 E, 1390 m, 05 Sept 2023, *Lal Tlanhlui 100030* (holotype ASSAM; isotypes MZUH, MUMP).

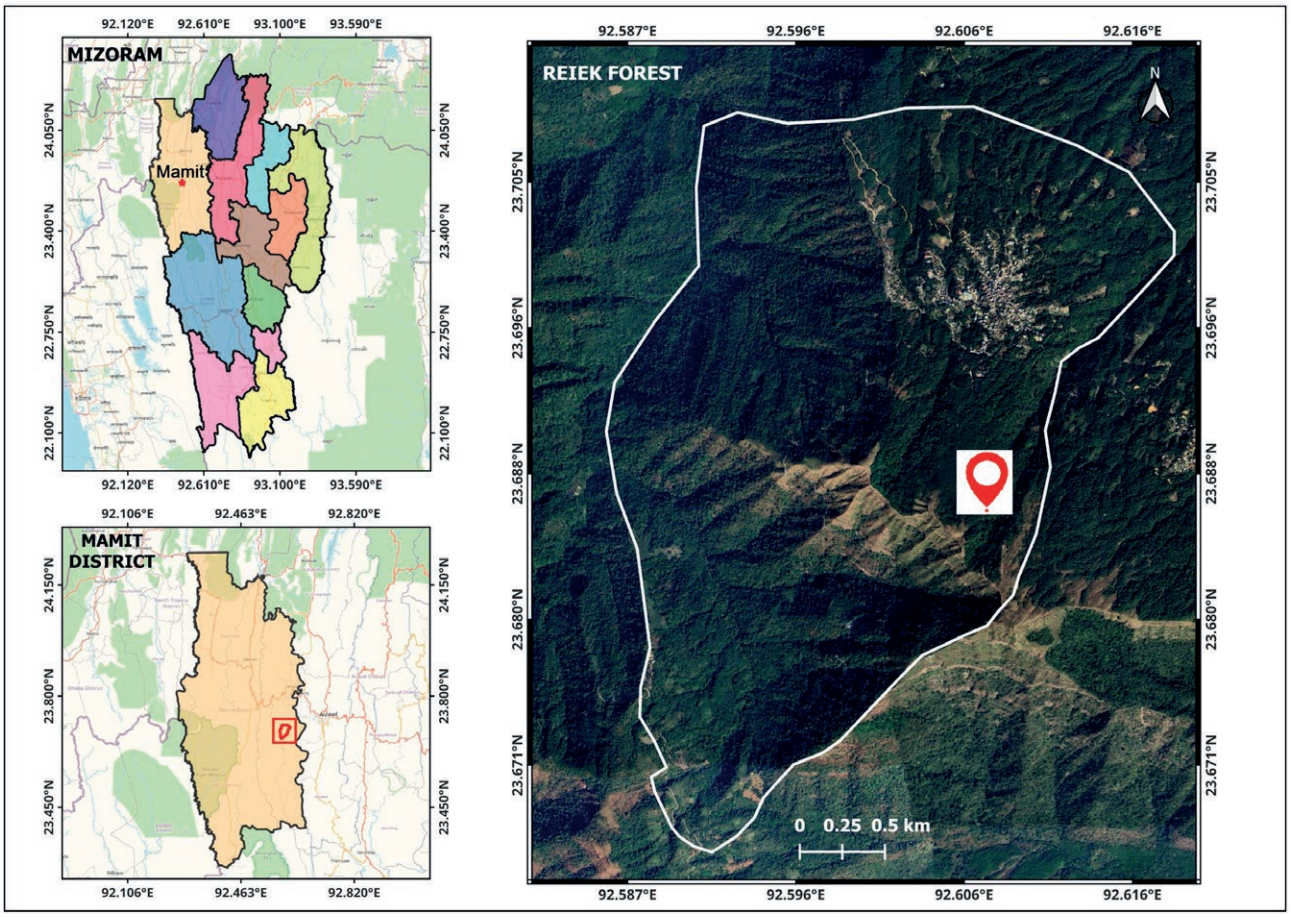

Figure 1. Location map of Mizoram and Mamit District showing the type location of *Chamaegastrodia reiekensis* Tlanhlui, S.D.Khomdram & S.D.Yumkham.

LSID.: urn:lsid:ipni.org:names:77355021-1

Diagnosis

Chamaegastrodia reiekensis differs morphologically from *C. guidongensis* in having slender rhizome with 2–3 mm diameter (*vs.* stout rhizome, 3–8 mm diameter), compact, non-adpressed sheathing scales, (*vs.* lax, adpressed sheathing scales), floral bracts equalling or exceeding the ovary (*vs.* 2/3 the length of ovary), glossy red flower (*vs.* pale hazel to orange yellow flower), larger dorsal sepals 7–9 × 4–5 mm, lateral sepal 9–12 × 3–4 mm (vs. dorsal sepal 1.7 × 4.5 mm, lateral sepal 6.4 × 3.1 mm), petals 9–10 × 3–4 mm (*vs.* 4.8 × 2.3 mm, lip with hypochile more dilated, sharp and more prominently dentate flanges confined to the mesochile.

Description

Terrestrial achlorophyllous herbs, rhizome slender, 2–3 mm in diameter, 9–14.5 cm tall, erect, covered with overlapping non-adpressed sheathing scales. Scales 1.3–1.5 × 0.8–1.2 cm, decurrent at base, apex acute, red, alternate, margin sparsely hairy. Inflorescence with 2–9 flowers, rachis 1.5–3 cm. Floral bracts red, 1.2–1.4 × 0.5 cm, glabrous, equalling or exceeding the ovary in length, lanceolate, sessile. Flowers non-resupinate. Sepals bright red, glossy, sparse glandular hair at margin, cuticular ridges present. Dorsal sepal 7–9 × 4–5 mm, ovate, apex acute. Lateral sepals 9–12 × 3–4 mm, falcate, apex acute. Lateral petals 9–10 × 3–4 mm, red parallel stripes present on either side of the mid-rib throughout the length, apex acute to obtuse, lanceolate, falcate. Lip 11–13 × 4–6 mm, canoe-shaped, mesochile margin distinctly sinuate, incurved, hypochile broader than epichile, concave–saccate, wrapping the column, yellowish red, basally two yellow triangular shaped calli at each side, mesochile with sharply dentate flanges, epichile folded inward, almost touching the margin. Column short, stout, 5–8 mm, two triangular falcate yellow wings attached to apex vertically, 1 mm, operculum ovate, apex acuminate in

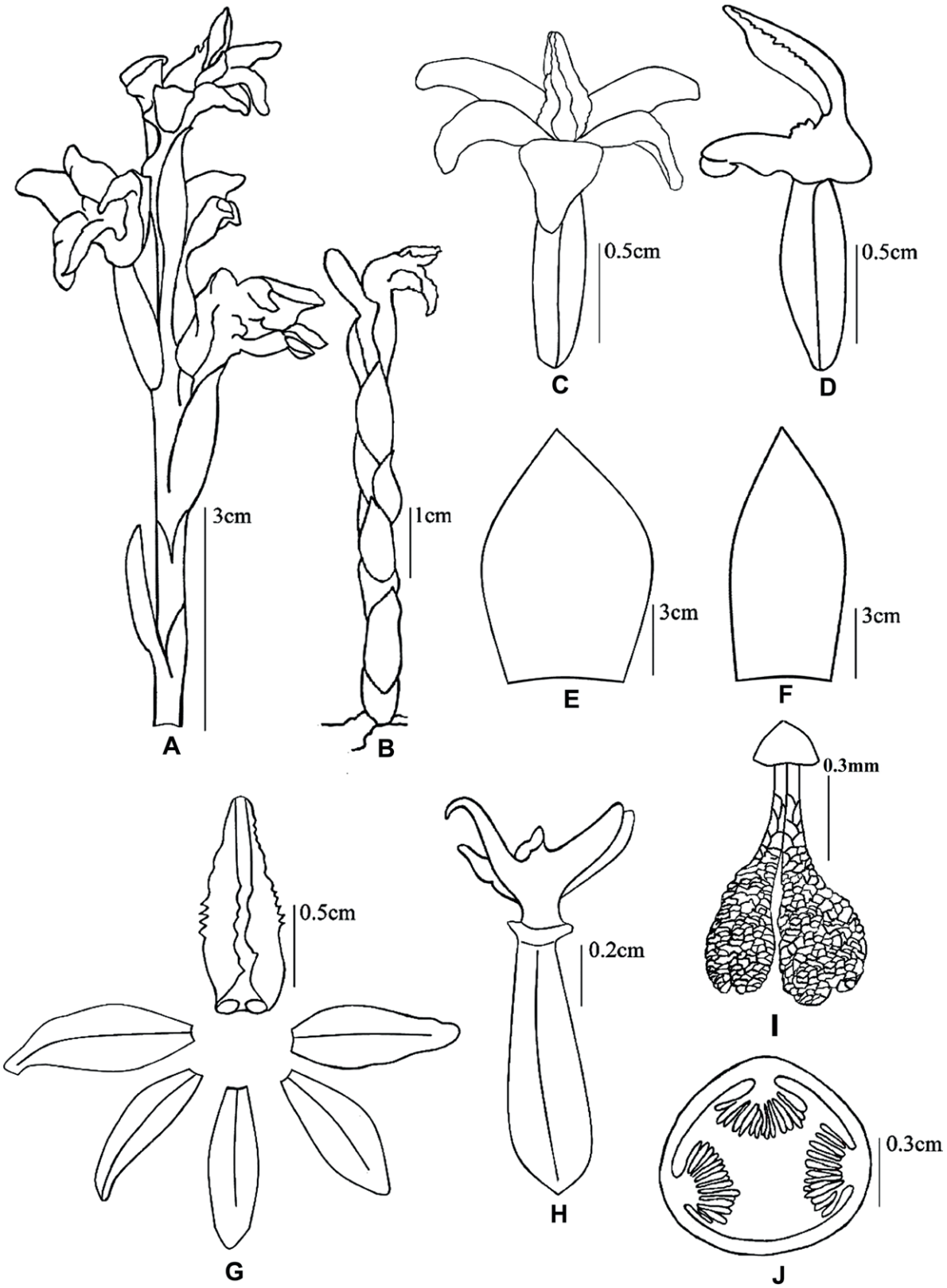

Figure 2. *Chamaegastrodia reiekensis* Tlanhlui, S.D. Khomdram & S.D. Yumkham A. Inflorescence B. Habit C–D. flower (front & side view) E. Sheathing scales F. Floral bract G. Calyx & corolla opened H. Column I. Pollinia J. Transverse section of ovary.

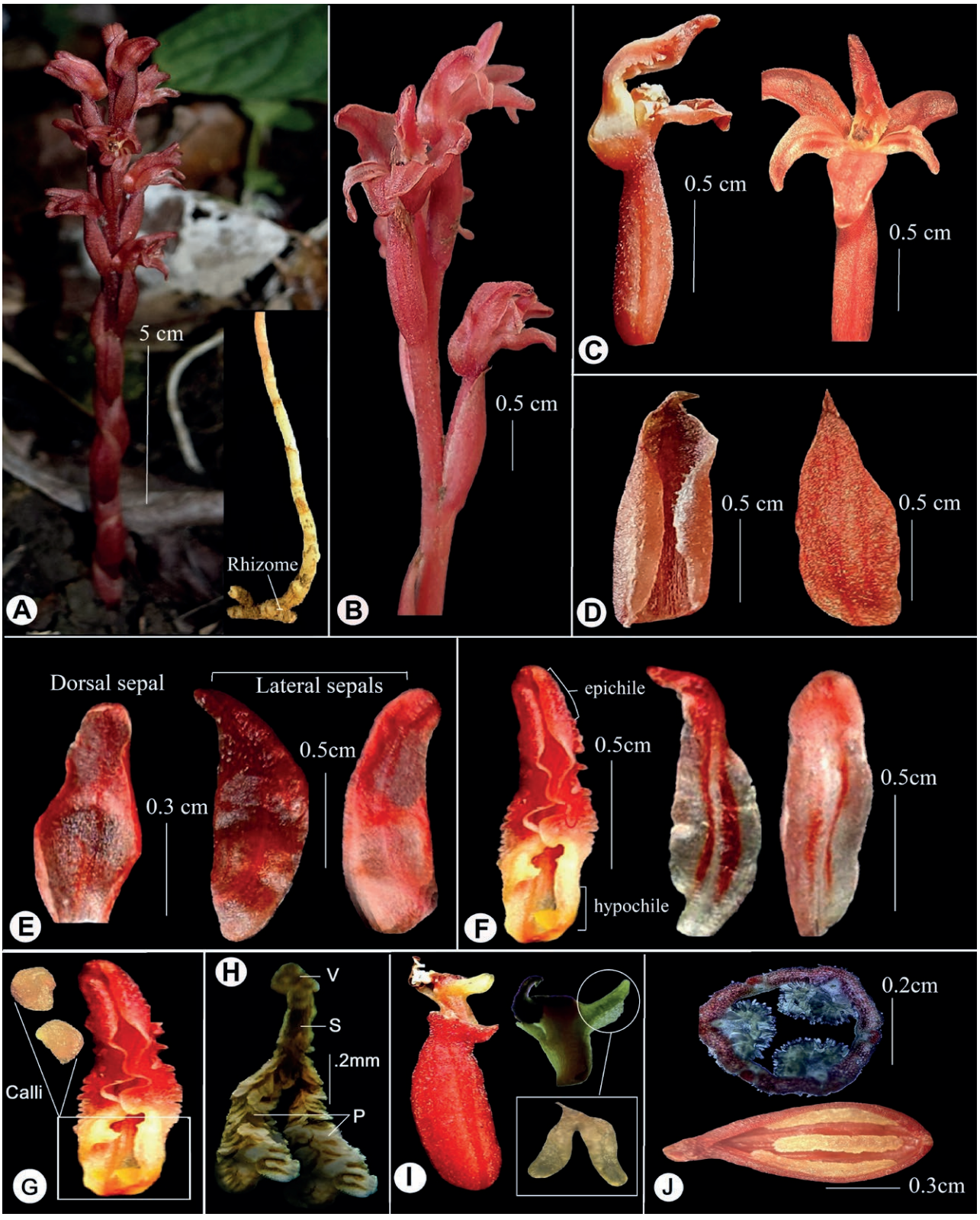

Figure 3. *Chamaegastrodia reiekensis* Tlanhlui, S.D. Khomdram & S.D. Yumkham A. Habit (inset showing rhizome) B. Inflorescence C. Flower D. Sheathing scale and floral bract E. Calyx F. Corolla G. Lip with calli H. Pollinia (P: pollinarium, S: Stipe, V: Viscidium) I. column showing wings J. transverse section and longitudinal section of ovary.

front, attached to column by a short linear filament, 2 pollinia, 0.8–1 mm, sectile, massulated, solitary viscidium, slender stalk, rostellum short, dark brown. Ovary fusiform, 9–10 mm long, 4 mm in diameter, glandular hairs present, placentation parietal, 3-loculed, ovule numerous. Fruit a long cylindrical capsule, 10–11 × 2–3 mm, pubescent, reddish brown at maturity with 3 longitudinal ridges, seeds numerous.

Etymology

The species takes its name from the type locality, Reiek, a well-known mountainous tourist destination in Mizoram state, Northeast India.

Suggested Common name

Reiek nauban par (Mizo).

Flowering & Fruiting

Flowering from August to September and fruiting from September to October.

Habitat and Ecology

Reiek forest exhibits a complex canopy structure with tall emergent trees, a dense understorey, and various intermediary layers providing habitats for many unique plant species. With the temperatures fluctuating between 20 to 28°C, Reiek forest sustains a conducive environment for tropical vegetation throughout the year. The annual rainfall ranges from 200 to 250 cm. *Chamaegastrodia reiekensis* grows in moist humus rich areas near bamboo clumps at an elevation of 1500 m above sea level. The recent discovery of *Aeschynanthus reiekensis* M. Lalhlupuii, S.D. Khomdram and S.D. Yumkham of Gesneriaceae family (Lalhlupuii et al. 2023) from this locality also highlights the biodiversity richness of the region.

Distribution

Only known from the type locality at Reiek Tlang, located in the state of Mizoram, India, which is part of the Indo-Burma biodiversity hotspot.

Preliminary Conservation status

The newly described species was first collected in September 2023 and again during the end of August to October, 2024 from the type locality of Reiek Tlang within the Reiek forest, which is a community-protected area in Mizoram. Despite extensive exploration in other parts of Mizoram, this newly described orchid has not been found outside of Reiek Tlang, suggesting that its distribution is restricted within the type locality only. Reiek forest is significant as a prominent tourist destination in the state. The species was found solely within the type locality, where it forms a single population with an area of occupancy less than 10 square kilometre (<10 km^2), occurring in a single location. Additionally, the population is sparse with fewer than 50 mature individuals (<50). Based on these findings, the species has been provisionally categorized here as Critically Endangered (CR) according to the criteria B2ab (ii, iii) c (ii, iii); D of IUCN Red List Categories and Criteria (IUCN 2022).

COMMENTS

The generic placement of *Chamaegastrodia* has long been debated among taxonomists and orchidologists (Tiwari et al. 2021). The currently discovered new species is placed under *Chamaegastrodia* along with already known taxa - *C. asraoa*, *C. guidongensis*, C. *inverta*, *C. nanlingensis*, *C. poilanei*, *C. shikokiana* and *C. vaginata*. In the present study, we recognized *C. asraoa, C. nanlingensis* and *C. poilanei* as a part of the genus instead of *Odontochilus* based on monophyly (Liu 2018; Qu et al. 2022). During the detailed studies done on *Chamaegastrodia*, all the species exhibit distinct morphological differences in the lip which varies from a seemingly peloric form in *C. vaginata* to Y-shaped (*C. nanlingensis* and *C. poilanei*) to T-shaped (*C. asraoa* and *C. shikokiana*) as well as canoe-shaped in *C. guidongensis* (Fig. 5). Although *C. guidongensis* and the newly described *C. reiekensis* share a similar lip shape, *C. reiekensis* differs in having a wider hypochile and presence of sharp and more prominent dentate flanges mainly confined to mesochile and a distinctly sinuate mesochile margin (Tab. 1, Fig. 4). The stability of the characteristics of *C. reiekensis* was confirmed by multiple field visits during 2023 to 2024 confirming its status as a new species. The discovery of this new holomycotrophic species underscores the unique characteristics of the habitats of Northeast India, from where all other Indian taxa of the genus have been reported so far, emphasizing the urgent need for their conservation due to their sensitivity and risk of habitat loss.

Molecular characteristics of Chamaegastrodia reiekensis

The *matK* sequence from *Chamaegastrodia reiekensis* was analyzed and submitted to GenBank under the accession number PP873640. The consensus length of the *mat*K sequence is 503 bases with 30.1% G:C content. A Maximum Likelihood (ML) tree was constructed using *mat*K sequences in MEGA 12 to analyze the placement of *Chamaegastrodia reiekensis* among different

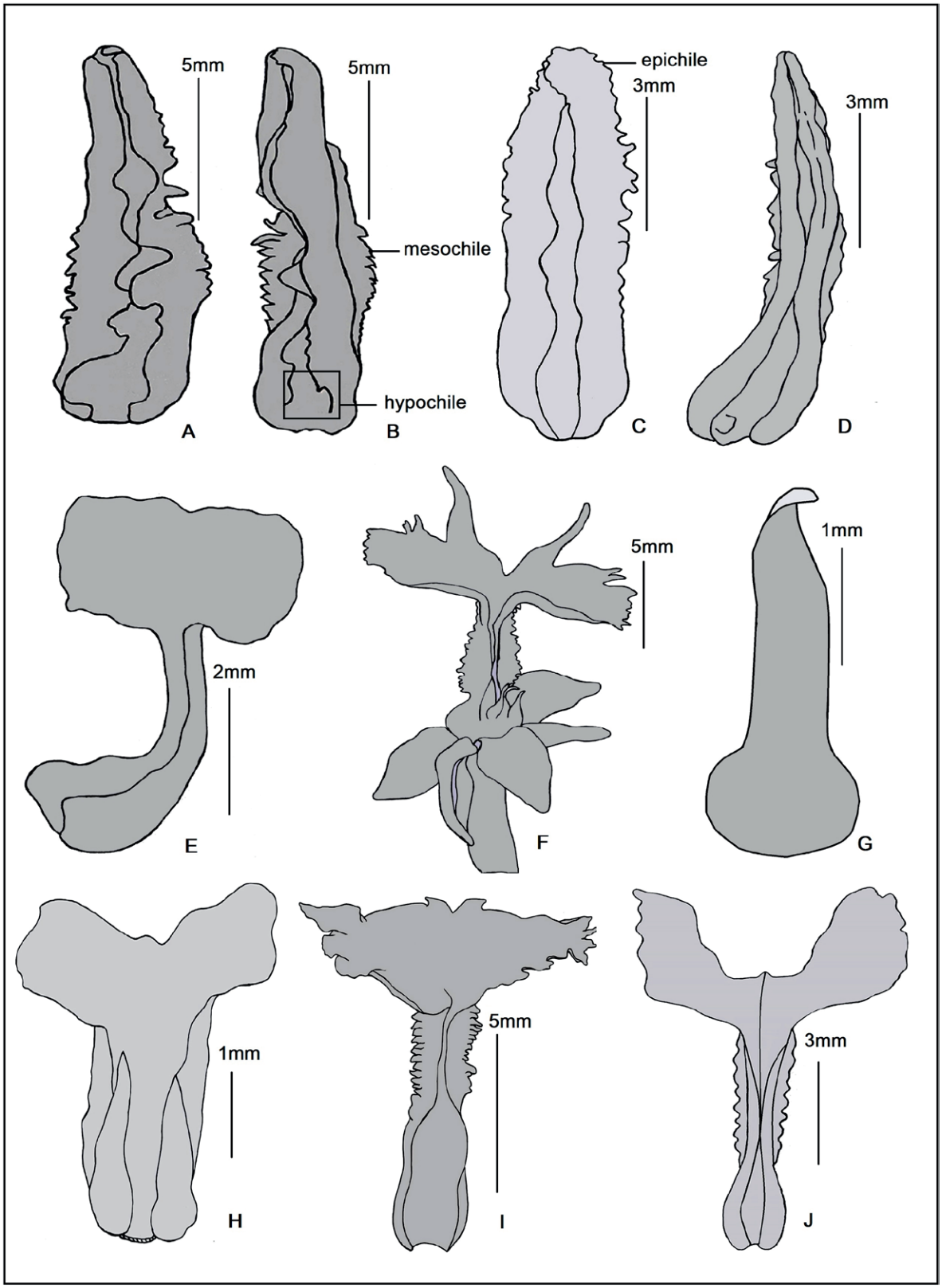

Figure 4. Variation of Lips in *Chamaegastrodia* A –B. *C. reiekensis* C –D. *C. guidongensis* E. *C. inverta* F. *C. poilanei* G. *C. vaginata* H. *C. shikokiana* I. *C. asraoa* J. *C. nanlingensis* (Seidenfaden 1994; Tian and Xing 2008; Qu et al. 2022).

Table 1. Morphological comparison of *Chamaegastrodia reiekensis* and *C. guidongensis*

Characters	*C. reiekensis*	*C. guidongensis*
Rhizome	Slender, 2–3 mm in diameter	Stout, 3–8 mm in diameter
Sheathing Scales	Compact, non-adpressed to stem, 1.3–1.5 cm long, glossy red, non–translucent, non-membranous	Lax, adpressed to stem, 0.7–1.5 cm long, pale hazel, translucent, membranous
Floral bracts	1.2–1.4 cm long, equalling or exceeding the ovary, glossy red	0.7 cm long, 2/3 the length of ovary, orange yellow-pale brown
Placement of floral whorls	Obliquely placed above ovary	Strongly incurved towards ovary
Sepals	Dorsal sepal 7–9 × 4–5 mm; lateral sepal 9–12 × 3–4 mm, sparse glandular hair at margin, non-translucent	Dorsal sepal 1.7 × 4.5 mm; lateral sepal 6.4 × 3.1 mm, densely puberulous, translucent
Petals	9–10 × 3–4 mm, reddish white at base, red parallel stripes present on either side of the mid-rib throughout the length	4.8 × 2.3 mm, pale yellow-orange at base, parallel veins only at apex
Lip	1.1–1.3 cm long, hypochile more dilated, glossy red colour, mesochile margin prominently wavy, 2 triangular yellow calli at base	Upto 0.93 cm long, yellow orange colour, hypochile less dilated, mesochile margin slightly wavy, 2 sarcoma-shaped orange calli at base
External Flanges	Dentation prominent and mainly confined in mesochile	Dentation less prominent and confined to mesochile and epichile
Column	5–8 mm long	Upto 5 mm long
Distribution	Mizoram (India)	Guidong County, Hunan, China

Source for *C. guidongensis*: Qu et al. (2022).

members of Orchidaceae with *Vanilla pilifera* as an outgroup species (Fig. 5). The phylogram suggests a close relationship between *C. reiekensis* and *C. inverta* since they are clustered in Clade II(b) as compared to *C. shikokiana* in the Clade II (a). The tree is consistent with monophyly of *Chamaegastrodia*.

Key to the species of *Chamaegastrodia* Makino & F.Maek.

1. Lip bilobulate 2

   Lip not bilobulate 6

2. Lip T-shaped 3

   Lip Y-shaped 5

3. Lobules of lip epichile entire or with slightly erose edges 4

   Lobules on lip epichile coarsely fringed..... ***C. asraoa***

4. Lip mesochile with external flanges, 2 sub-globose calli at base ..... ***C. shikokiana***

   Lip mesochile lacking external flanges, 2 domed-shaped calli at base ..... ***C. inverta***

5. Lip with a pair of elongate introrse lobules at the epichile lobes ..... ***C. poilanei***

   Lip without a pair of elongate introrse lobule at the epichile lobes ..... ***C. nanlingensis***

6. Lip canoe-shaped 7

   Lip narrowly ovate to oblong..... ***C. vaginata***

7. Lip light yellow to pale hazel red, floral bracts 2/3rd length of ovary, mesochile margin weakly sinuate ..... ***C. guidongensis***

   Lip bright red, floral bracts equalling or exceeding the ovary, mesochile margin distinctly sinuate..... ***C. reiekensis***

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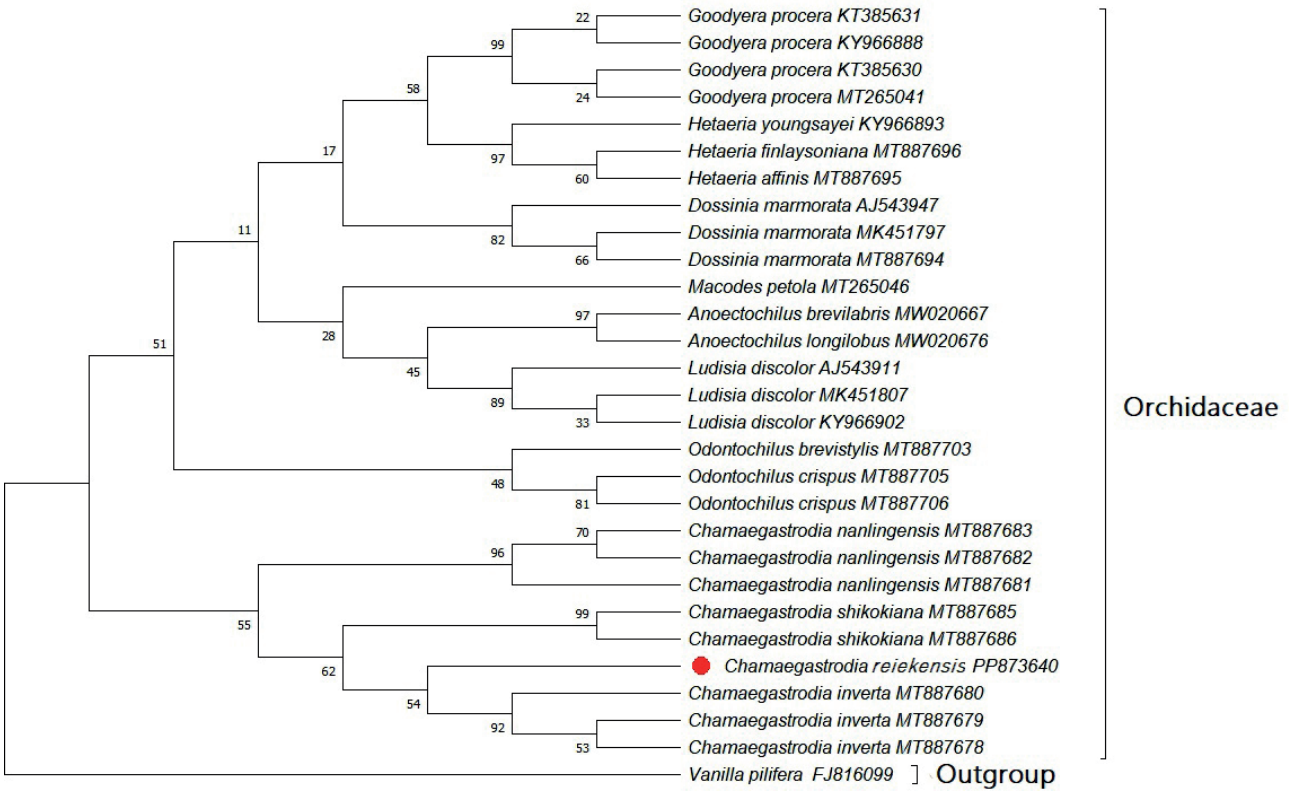

Figure 5. Phylogenetic tree of *Chamaegastrodia reiekensis* reconstructed based on Maximum Likelihood (ML) as a cladistic method comprising of 27 *matK* nucleotide sequences using MEGA 12. Red solid circle indicates the placement of *C. reiekensis* between *C. inverta* and *C. shikokiana* in the phylogenetic tree.

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Haplocoelum aurantium, Sapindaceae, a new tree species from submontane forest in Cameroon

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Abstract. *Haplocoelum aurantium* Burgt, Ngansop & Tchiengué, Sapindaceae, is described and illustrated. It is a tree, to 18 m high, with a stem to 50 cm diameter, often overhanging. On mature trees the leaves usually have 8–18 leaflets; 40% of leaves have 14 or 16 leaflets. 28% of leaves have an odd number of leaflets. The leaflets are opposite, sub-opposite, or alternate. The flowers are unknown. The fruits are indehiscent, orange and globular, 1.5–2.3 cm diameter. *Haplocoelum aurantium* occurs in submontane forest, at 700–1400 m elevation. The tree species is endemic to Cameroon, in parts of the Littoral Region, Southwest Region and West Region. Twelve herbarium collections have been made, in an area of 7500 km^2. *Haplocoelum aurantium* is provisionally assessed as Vulnerable.

Keywords: Africa, endemic, *Haplocoelum*, Sapindaceae, vulnerable.

INTRODUCTION

Haplocoelum Radlk. is a genus in the Sapindaceae family, of small to medium sized trees, occurring in tropical Africa and southern Africa. There exist six accepted taxa: four species, one of which is divided into three subspecies (GBIF 2025; POWO 2025). *Haplocoelum acuminatum* Radlk. ex Engl. occurs in Congo (Kinshasa) and Northeast Angola, *Haplocoelum inopleum* Radlk. occurs in Somalia, Kenya, Tanzania and Mozambique, and *Haplocoelum intermedium* Hauman occurs in Gabon, Congo (Brazzaville), Congo (Kinshasa) and Western Tanzania. *Haplocoelum foliolosum* (Hiern) Bullock occurs from Cameroon to Ethiopia and to South Africa and is divided into three subspecies. Two formerly accepted species of *Haplocoelum, H. mombasense* Bullock and *H. strongylocarpum* Bullock, were ranked to subspecies of *H. foliolosum* (Friis et al. 1996; Davies and Verdcourt 1998), without providing evidence to support this. *Haplocoelum mombasense* was named to *H. foliolosum subsp. mombasense* (Bullock) Verdc. and *H. strongylocarpum* was named to *H. foliolosum subsp. strongylocarpum* (Bullock) Verdc.

Nine sterile herbarium specimens from Cameroon, seen at BR, K, P, WAG and YA were determined by the authors of the present study to belong to the genus *Haplocoelum*. Only two of these sterile specimens had already been named to this genus before, most specimens had been named to genera in other families. The authors were able to collect fruiting specimens in 2016 and 2019, when they visited the areas where two of the sterile specimens had been collected more than 10 years earlier. The authors have not seen any flowering plants. The authors also could not find an existing flowering herbarium collection of this species. The leaves of the two fruiting specimens differ from those of the other species of *Haplocoelum*. The new species of *Haplocoelum* is here described.

MATERIALS AND METHODS

Herbarium sheets from the herbaria BR, K, MO, P, WAG, YA were studied. All cited material was seen, as an herbarium specimen and/or as an image. Herbarium collections without co-ordinates on their labels were georeferenced with Google Earth (2025). The distribution map was made with Simplemappr (Shorthouse 2010). The morphological terminology follows that of Beentje (2016). All measurements of leaves were made on the two fertile collections only, *Burgt* 2383 and *Tchiengue* 3767. The number of leaflets per leaf, and the size of the leaflets of juvenile trees and saplings may be different from those of mature trees. Specimens made from juvenile trees and saplings were therefore not used in the descriptions, but they are still cited and appear in the distribution maps. A preliminarily IUCN extinction risk category was determined following IUCN criteria (2012, 2024).

RESULTS AND DISCUSSION

Haplocoelum aurantium Burgt, Ngansop & Tchiengué **sp. nov.** (Figure 1).

Type: Cameroon, Littoral Region, Ebo Proposed National Park, Bekob, 4° 21' 30" N, 10° 25' 00" E, 900 m, fr., 17

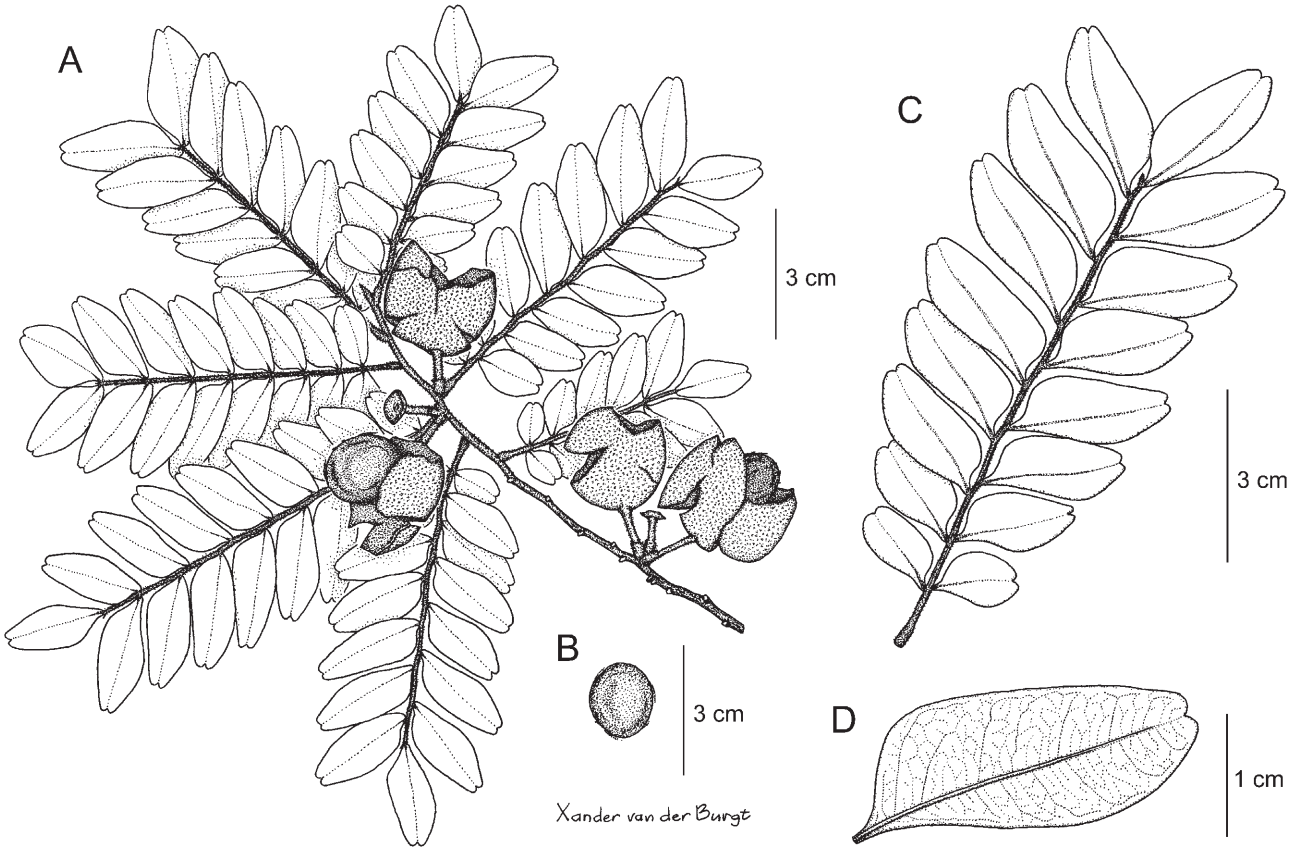


Figure 1. *Haplocoelum aurantium*. A Branch with leaves, fruits and seeds. B Seed. C. Leaf upper side. D Leaflet upper side. A – D from *Tchiengue* 3767 (K, YA). Drawing by Xander van der Burgt.

Figure 2. Stem of *Haplocoelum aurantium*. From *Burgt* 2383. Photo: Xander van der Burgt.

Figure 3. Leaves of *Haplocoelum aurantium*. From *Burgt* 2383. Photo: Xander van der Burgt.

Sep. 2016, *Tchiengue & Ekwoge* 3767 (holotype YA, isotype K001243774). (Figs. 1–4).

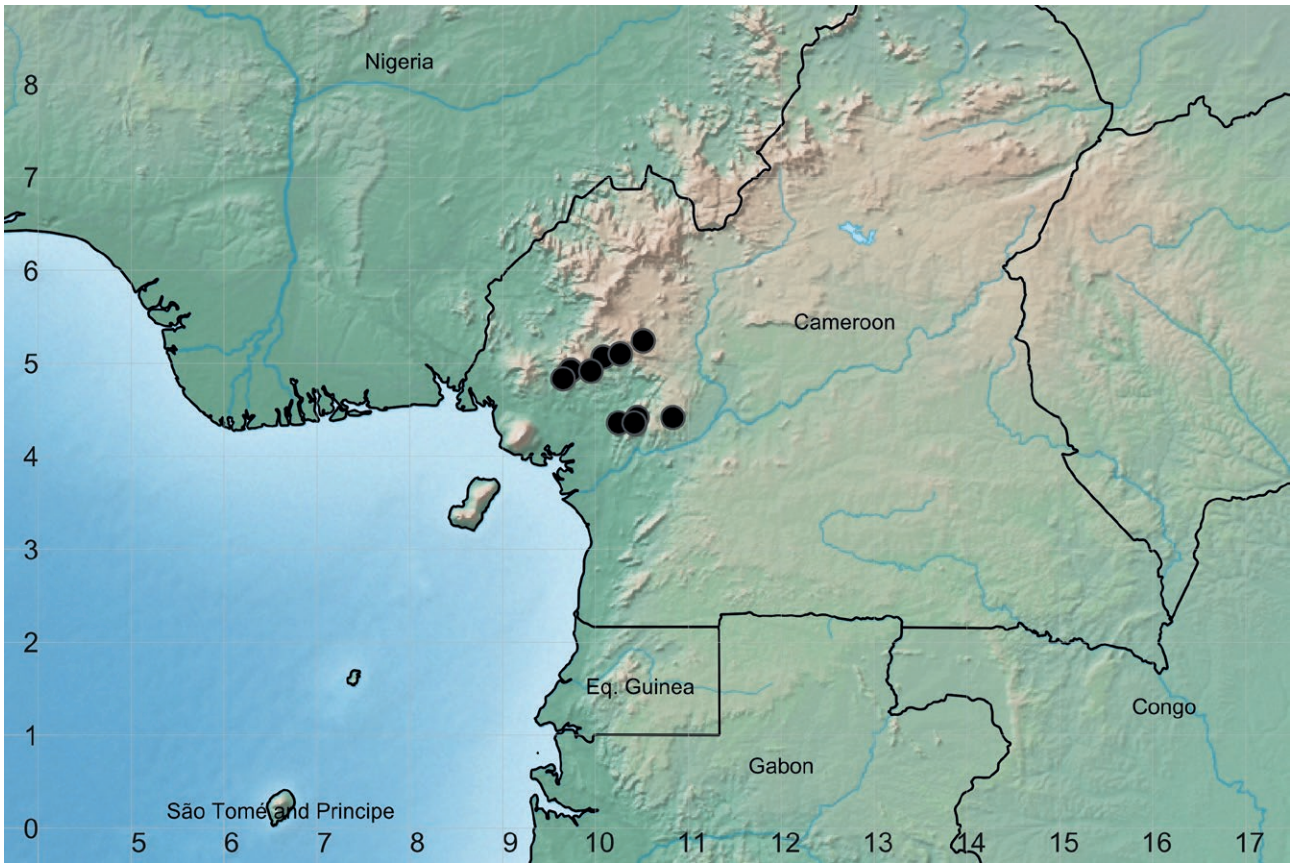
Diagnosis

Haplocoelum aurantium morphologically resembles *Haplocoelum intermedium* Hauman; a species from lowland forest in southern Gabon, Congo Republic and Democratic Republic of Congo. The largest leaflets of *H. aurantium* are 2–3.2 cm long, and they are located in the middle or the top of the leaf. The largest leaflets of *H. intermedium* are 2.5–5 (–7.1) cm long, and they are always located at the top of the leaf.

Description

Tree, to 18 m high, stem to 50 cm diameter, often overhanging. Bark smooth, grey-brown, lenticels numerous, same colour. Twigs densely pubescent with hairs to 0.3 mm long, older twigs glabrescent. Internodes 0.5–1.5 cm long. Leaves alternate, distributed evenly along the twig. Stipules absent. Leaves on mature trees 5–11.5 × 3–5 cm, petiole 0.7–1.2 cm long, rachis 2.5–7 cm long, narrowly winged, wings erect, 0.2 mm high, petiole and rachis densely hairy on both sides with hairs to 0.3 mm long, rachis wings glabrous; leaves paripinnate or imparipinnate; leaflets opposite, sub-opposite, or alternate, leaflets on mature trees (6–) 8–18 (–19), on juvenile trees to 26 leaflets, on mature trees 40% of leaves have 14 or 16 leaflets, 28% of leaves have an odd number of leaflets; petiolules up to 0.5 mm long or leaflets subsessile, densely hairy; leaflets obliquely oblong, apex deeply emarginate, margin entire and inrolled; largest, upper and middle leaflets 2–3.2 × 0.8–1.2 cm, smallest, lowest leaflets 1–1.6 × 0.6–1 cm; leaflet blade glabrous on both sides, midrib sparsely hairy to glabrescent on both sides; venation prominent on both sides, 8–12 pairs of secondary veins. Inflorescence and flowers unknown. Infructescence axillary, in leaf axils of extant and recently fallen leaves, 1–4 fruits; peduncle 2–6 mm long, 2 mm diameter, pedicel 4–7 mm long, 1.5 mm diameter, pubescent; fruit indehiscent, orange, globular, 1.5–2.3 cm diameter, glabrous, smooth, lenticels numerous; fruit not stipitate, remnants of sepals at base, apex apiculate, 0.5–1 mm long; epicarp woody, brittle, 0.3–0.5 mm thick; fruit probably developed from a 3-locular ovary, containing a single seed; seed ellipsoid, 14–18 × 12–15 × 7–9 cm, arillode almost completely covering the seed. Seedling epigeous, first pair of leaves opposite, with 10 leaflets each, leaflets 2–2.7 × 0.8–1 cm.

Figure 4. Old infructescence of *Haplocoelum aurantium* with the remains of four fruits. From *Burgt* 2383. Photo: Xander van der Burgt.



Map 1. Distribution of *Haplocoelum aurantium*.

Etymology

The genus *Haplocoelum* is named after the fruit haplo, simple and koilos, cavity (Fouilloy and Hallé 1973). The species *aurantium* is named after the orange colour of the fruits.

Distribution

Haplocoelum aurantium occurs in Cameroon, in parts of the Littoral Region, Southwest Region and West Region. The species is predicted to occur also in the western part of the Central Region, where there exist several hundreds of square km of submontane forest habitat within the extent of occurrence of the 12 collection localities, at distances between 5 km and 40 km to some of these 12 collecting localities.

Habitat

Haplocoelum aurantium occurs in submontane forest, at 700 – 1400 m altitude. The collection *Burgt* 2383 was made on steep bedrock at the edge of an inselberg (Fig. 2).

Ecology

Three old chimpanzee nests were seen in neighbouring trees at the collecting locality of *Burgt* 2383. Chimpanzees may be amongst the seed dispersers of *Haplocoelum aurantium*.

Conservation status

The extent of occurrence of the 12 herbarium collections of *Haplocoelum aurantium* is 7500 km^2. The area of occupancy of these 12 collections is 44 km^2. The extent of occurrence and area of occupancy should not only include the actually known sites, but also inferred or projected sites (IUCN 2024: p. 53). *Haplocoelum aurantium* occurs without doubt in many more localities, since there exist large areas of potentially suitable submontane forest habitat within and near the extent of occurrence (Google Earth 2025). The actual extent of occurrence may be estimated as more than 10000 km^2, but less than 20000 km^2. The actual area of occupancy may be estimated as more than 500 km^2, but less than 2000 km^2.

When comparing the 12 collection localities of *Haplocoelum aurantium* with a map of Cameroon's Forest Estate (MINFOF & WRI 2024), it appears that none of the 12 collection localities of *H. aurantium* is clearly located within a protected area. Several of the collections from the northern part of the distribution (Map 1) are close to one or more of the c. 10 forest reserves in this area. It is therefore likely that *H. aurantium* occurs in one or more of these forest reserves. The southern part of the distribution (Map 1) consists of an expanse of lowland and submontane forest of c. 110 km × 20 – 30 km. In this area there are no protected areas at all anymore. Four collections were made in the Ebo Proposed National Park. Two years ago, the Ebo Proposed National Park was converted into two logging concessions; this is not yet recorded on the map of Cameroon's Forest Estate (MINFOF & WRI 2024). *Haplocoelum aurantium* occurs in several IPA's (Important Plant Areas) in Cameroon (Murphy et al. 2023): in the Ebo Forest, in Mt Nlonako, and probably also in Mt Kupe and Mt Mwanenguba. This publication advises increased protection of the forest in these areas, by local communities as well as the Cameroon government.

Five mature trees of *Haplocoelum aurantium* were seen during the collecting of *Burgt* 2383, in the Ebo Proposed National Park, in sub-montane forest on steep bedrock at the edge of an inselberg (Fig. 2). Although an old logging road was seen at less than 1 km distance, the logging probably did not reduce the number of mature individuals of *H. aurantium* growing in an area too steep and rocky for logging vehicles. The tree species is not targeted by loggers, because the trees are too small to produce timber. This population of *Haplocoelum aurantium* is also safe from farming, because the nearest farmland is 10 km away and the area is far too rocky to be suitable for farming. Three other collections were made in the Ebo Proposed National Park, in remote areas with large expanses of closed forest (Google Earth 2025). However, eight of the 12 collecting localities are closer to farmland, near villages and roads, in forest that appears secondary on Google Earth (2025). It is likely that there has been decline in quality of habitat and in the number of mature individuals. Therefore, *Haplocoelum aurantium* is here preliminarily assessed as Vulnerable B1(iii,v)+B2(iii,v).

Notes

There occur no other species of *Haplocoelum* in the region where *H. aurantium* is found. The only other species of *Haplocoelum* occurring in Cameroon is *H. foliolosum*, a widespread species. This is a species from dry wooded grassland habitats, which occurs in Cameroon in the North Region, where the annual rainfall is much lower than in the distribution area of *H. aurantium*.

Flowers of *Haplocoelum aurantium* have not yet been collected. The flowers probably have the same morphology as those of the other species of *Haplocoelum* (as described in Davies & Verdcourt 1998; Exell et al. 1966; Fouilloy & Hallé 1973). If so, these flowers are small, about 0.5 cm long, with 5 to 6 sepals, no petals, and 5 or 6 stamens.

Sterile specimens of *Haplocoelum aurantium* have been confused with several species in the Leguminosae subfamily Detarioideae. Several sterile collections were found named, often with hesitation, to *Tessmannia anomala* (Micheli) Harms, *Tessmannia lescrauwaetii* (De Wild.) Harms, *Copaifera mildbraedii* Harms, *Hymenostegia* Harms, and *Plagiosiphon* Harms. Species of *Tessmannia* and *Copaifera* have numerous translucent dots in the leaflets; but species of *Haplocoelum* do not have translucent dots in the leaflets. Species of *Hymenostegia* and *Plagiosiphon* have opposite leaflets (the lower leaflets sometimes sub-opposite); while the leaflets of *H. aurantium* are often alternate. The leaflets of *H. aurantium* often have a slightly concave lower leaflet edge, which these species of Leguminosae-Detarioideae do not have. Sterile specimens of *Rourea obliquifoliolata* Gilg, Connaraceae, may also be confused with *H. aurantium*, but lower leaflet edge of *R. obliquifoliolata* is never concave, and the microscopic structure of the leaflet surfaces is different.

Additional specimens examined

CAMEROON. Littoral Region. Ebo Proposed National Park, hill 2 km northeast of Njuma Camp, 4° 21' 29.9" N, 10° 15' 0.4" E, 850 m, fr., 11 Dec. 2019, *Burgt, Alvarez & Ngansop* 2383 (B, BR, EA, FT, G, K, LISC, MO, P, PRE, SCA, SING, WAG, YA); Ebo Proposed National Park, Yingui, Ndokbaembi on N-S ridge, 4° 20' 52" N, 10° 25' 40" E, 820 m, sterile, 21 April 2005, *Cheek* 12465 (K); Ebo Proposed National Park, Iboty to Bekob village, 4° 25' N, 10° 27' E, 680 m, sterile, 14 Feb. 2006, *Cheek* 12910 (K); Nonn, route Ndom, Pont de Kikok, 45 km south of Ndikinimeki, sterile, 10 Dec. 1971, *Letouzey* 10728 (BR, P, YA); West slopes of Mont Nlonako, 5 km SSE Nkongsamba, sterile, 17 Mar. 1976, *Letouzey* 14453 (BR, K, YA); **Southwest Region**. Abang, Ngomboku, 4° 55' N, 9° 44' E, 850 m, sterile, 11 Dec. 1999, *Cheek* 10312 (K, P, WAG); same loc., 1000 m, sterile, 15 Dec. 1999, *Cheek* 10381 (K); Slopes NW of Ngusi, 15 km NNW of Tombel, sterile, 21 April 1976, *Letouzey* 14655 (K, P, YA); **West Region**. near Mounko, 20 km SW of Bafang, sterile, 21 Nov. 1974, *Letouzey* 13274 (P, YA); Badoumkassa to Balam, 12 km

ESE Bafang, sterile, 24 Nov. 1974, *Letouzey* 13316 (YA); Nde Department, Bangang Fokam Village, sterile, 2018, *Ngansop & Nana* 392 (K, P, WAG, YA).

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A new species of *Borneoa* (Araceae) from Sabah, Malaysian Borneo

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Abstract. *Borneoa rawogensis* Kartini & Nor Rasyidah is described as taxonomically novel species. *Borneoa rawogensis* is a lowland mesophytic species found at c. 40 m a.s.l. distinguished from all described *Borneoa* by lacking prominent sterile interstice that separating the pistillate and staminate zones.

Keywords: Araceae, *Borneoa*, Malaysian Borneo, Schismatoglottideae.

INTRODUCTION

Integrative molecular and morphological analyses (Boyce and Wong, 2008; Wong et al., 2010; Low et al., 2014; Low et al., 2018) have demonstrated that *Schismatoglottis* Zoll. & Moritzi, as circumscribed by Hay and Yuzammi (2000), is polyphyletic. This finding has led to the recognition and establishment of several new genera. Subsequent work by Wong and Boyce (2024), supported by evidence from Low et al. (2018), further resolved the taxonomy by assigning species of *Schismatoglottis* characterized by pleionanthic shoots and variably senescing spathe limbs to seven newly described genera: *Aia* (S.Y.Wong & P.C.Boyce), *Ayuantha* (S.Y.Wong & P.C.Boyce), *Bau* (S.Y.Wong & P.C.Boyce), *Borneoa* (S.Y.Wong & P.C.Boyce), *Ibania* (S.Y.Wong & P.C.Boyce), *Sarawakia* (S.Y.Wong & P.C.Boyce) and *Tweeddalea* (S.Y.Wong & P.C.Boyce).

Borneoa are small to medium-sized herbaceous plants with petioles often scabrid-hispid and bear prominent, leathery ligules that are persistent but become marcescent with age; these ligules are frequently unequal in size. The inflorescences are erect, with a lower persistent region exhibiting markedly thickened walls. The spathe limb is predominantly white and undergoes disintegration or liquefaction during staminate anthesis (Wong and Boyce, 2024).

Currently the *Borneoa* comprises twenty-two species with all but one (*B. scortechini* (Hook.f.) S.Y.Wong & P.C.Boyce) restricted to island of Borneo.

Three species of the *Borneoa* are recorded for Sabah, all endemic. *Borneoa tahubangensis* (A. Hay & Herscovitch) S.Y.Wong & P.C.Boyce found just outside Kinabalu Park (Hay & Herscovitch 2003), *B. zainuddinii* (Kartini, P.C. Boyce & S.Y. Wong) S.Y.Wong & P.C.Boyce found in Tawau Hills

Park, Tawau (Kartini et al. 2017), and *B. mons* (Kartini) S.Y.Wong & P.C.Boyce found at Kota Marudu (Kartini, 2022). These three all have localized distributions in Sabah. Here we are describe a fourth species, *B. rawogensis* Kartini & Nor Rasyidahs **sp. nov.** in Sandakan.

Key to Sabahan species of the *Borneoa*

1a. Leaf blades narrowly obovate 2

1b. Leaf blades ovate or elliptic..... 3

2a. Spathe 7 cm long, pinkish; spadix 5.3 cm long; sterile interstice present. Kinabalu Parks about 1,100 m a.s.l. (only known from the type) ..... ***B. tahubangensis***

2b. Spathe 9 cm long, green with creamy limb; spadix 7 cm long; sterile interstice absent. Rawog river, Segaluid Lokan Forest Researve, Sandakan altitude about 40 m a.s.l..... ..... ***B. rawogensis***

3a. Leaf blade ovate to oblong-ovate, 14–26 cm long; Spathe pinkish, 12 cm long, sub-cylindrical; spadix 10 cm long; sterile interstice present. Mensalong Forest Reserve, Kota Marudu above 700 m a.s.l. ..... ***B. mons***

3b. Leaf blade broadly elliptic, 17 cm long; Spathe 4.5 cm long, dirty white; spadix 4 cm long; sterile interstice present. Tiku river, Tawau Hills Park below 400 m a.s.l..... ..... ***B. zainuddinii***

Borneoa rawogensis Kartini & Nor Rasyidah, **sp. nov.** (Figure 1).

Type: Malaysia, Sabah, Sandakan, Segaluid Lokan Forest Reserve 5°27.732′ N 117°33.905′ E, 5 September 2023, *Kartini 2744* (holotype BORH!).

Diagnosis

Borneoa rawogensis is readily distinguished from all other described species within the genus *Borneoa* by the absence of prominent sterile stamens separating the staminate and pistillate floral zones. It is further differentiated from other *Borneoa* taxa occurring in Sabah by its greenish spathe, an elongated staminate zone approximately 1.5 cm in length, and a yellow, cylindrical appendix measuring about 4.5 cm (Fig. 2).

Description

Mesophytic herb to c. 30 cm tall, solitary or forming small clumps. *Roots* covered with short soft minute hairs, c. 2 mm diam. *Stem* condensed, erect, to c. 1.5 cm diam., modules pleionanthic; internodes obscured by overlapping leaf bases. *Leaves* several together (8–14) with roots emerging from between their bases; petiole 7–12 cm long, D-shaped in cross-section, shorter than the length of the blade, very slightly asperulate, green, sheathing at the base, up to 1/2 of the petiole length, sheath extended into a blunt, fleshy ligular portion 0.5 cm long, degrading in the older petioles; blade narrowly obovate, thinly succulent, 18–30 cm long x 3.5–5 cm wide, matte green adaxially, paler abaxially, base very narrowly cordulate, tip acuminate; midrib abaxially prominent; abaxial primary lateral veins c. 12 on each side, alternating with lesser interprimaries, diverging at c. 30°; secondary venation almost all arising from the midrib; tertiary venation obscure. *Inflorescence* producing slightly faint sweet floral scent at anthesis, solitary to paired, developing sequentially with first inflorescence in late staminate anthesis when next inflorescence reaches pistillate anthesis, each inflorescence subtended by two cataphylls; peduncle c. 4 cm long; spathe c. 9 cm long, sub-cylindrical, tapering; lower spathe c. 3 cm long, greenish, differentiated from limb by colour and a faint constriction coinciding with top of staminate flower zone; limb c. 6 cm long, apiculate for c. 4 mm, cream, slightly open then crumbling-deliquescent at late staminate anthesis. Spadix sessile, shorter than the spathe, c. 7 cm long; pistillate flower zone c. 1 cm long, oblique insertion, 0.5–1 cm diam. at base; pistils crowded, creamy, squat mushroom-shaped, c. 1 mm diam.; stigma sessile, discoid, slightly sunken centrally, papillate, wider than ovary; interpistillar staminodes few, waxy white, scattered among the pistils, slightly taller than the pistils, c. 0.8 mm diam., the tops depressed in the middle; sterile interstice absent; staminate flower zone 1.5 cm long, cylindric; stamens creamy yellow, some-what lax, more or less dumbbell-shaped from above, c. 1 mm in diam.; pollen in short strings; appendix yellow, c. 4.5 cm long, c. 0.4 cm in diam., somewhat tapering-cylindric, appendix staminodes irregularly polygonal, flat topped. Infructescence not observed.

Etymology

From Rawog + *ensis*, a suffix denoting the place of origin.

Distribution

Borneoa rawogensis occurs on steep slopes and earth banks of the Rawog river, Segaluid-Lokan Forest Reserve, Sandakan at c. 20-40 m a.s.l. Populations are small with rather few individuals and scattered small clumps. A population of *Rhaphidophora fluminea* Ridl. was also observed growing along the muddy riverbank.

Ecology

The Rawog River valley consists of old alluvial deposits. The soils, primarily of the Tanjong Lipat Fam-

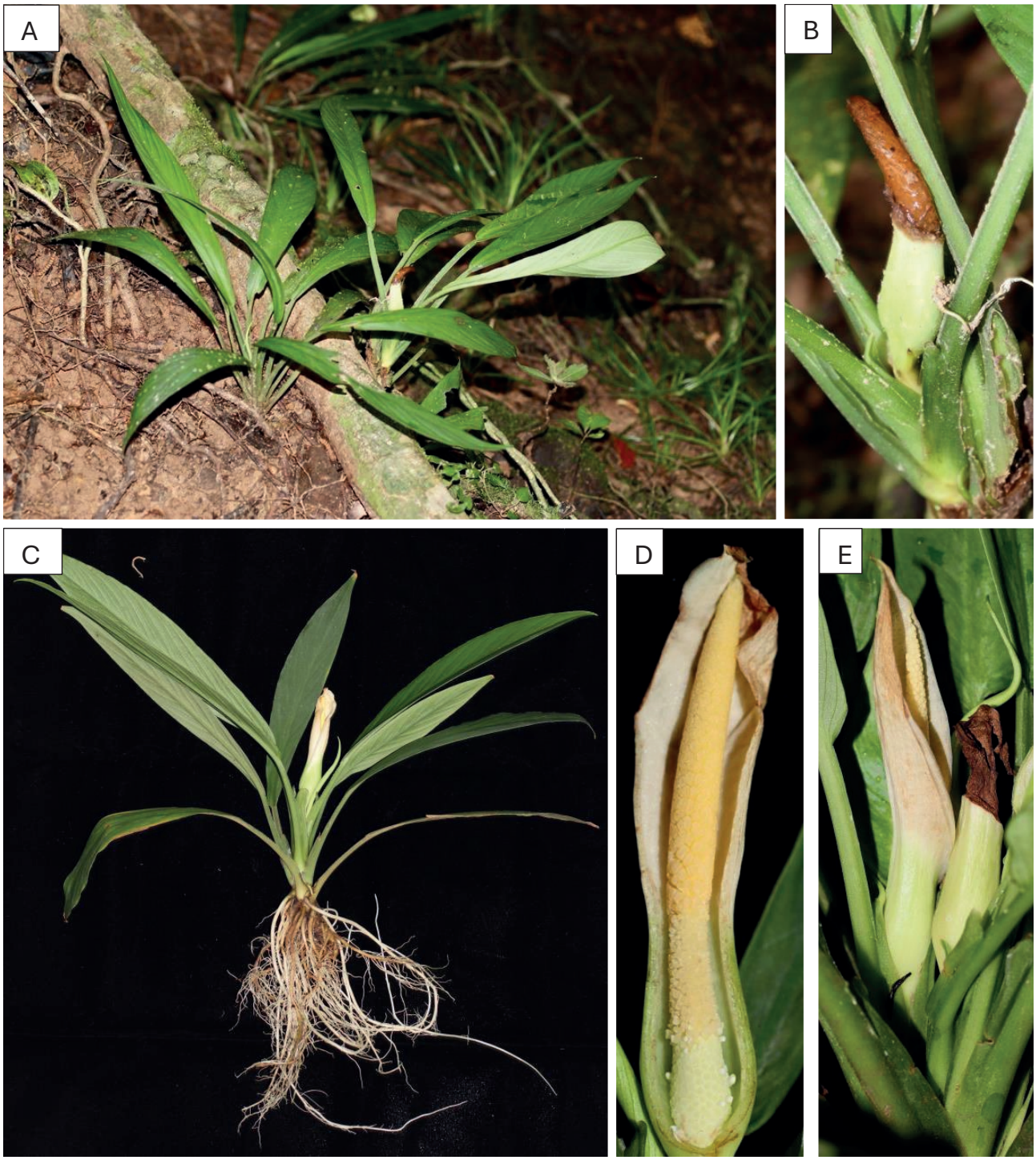

Figure 1. *Borneoa rawogensis* sp. nov. A: plants in habitat; B: spathe limb liquefying after staminate anthesis; C: whole plant prior to pressing; note hispid-scabrid petiole; D: inflorescence at late of pistillate anthesis (spathe artificially removed); E: flowering sympodial unit showing sequential development of inflorescences: pistillate anthesis (left), after staminate anthesis (right). All photographs by Kartini Saibeh.

ily, are derived from interbedded sandstone and mudstone/shale of the Sook Association. These soils are generally infertile and low in plant-available nutrients (Dyi et al. 2019).

Figure 2. Spadices of Sabahan *Borneoa* compared. A: *Borneoa rawogensis* Kartini & Nor Rasyidah; B: *Borneoa mons* (Kartini) S.Y.Wong & P.C.Boyce; C: *Borneoa zainuddinii* (Kartini, P.C.Boyce & S.Y.Wong) S.Y.Wong & P.C.Boyce. All photographs by Kartini Saibeh.

Notes

The Segaluid Lokan Forest Researve covers an area of 57,247 ha. The reserve has been managed by KTS Plantation Sdn. Bhd since 1993 under the License Agreement for Timber Tree Plantation and Wood Processing Plant which has an effective period of 96 years.

Borneoa rawogensis is the first recorded species of *Borneoa* found in alluvial forest at 40 m a.s.l.

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Homalomena renda (Araceae), a remarkable new species from the rainforests of Jambi, Sumatra

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Abstract. *Homalomena renda*, a new species from Jambi, Sumatra, Indonesia, is most similar to *H. cristata* in having cristate petioles, leaf blade margins, and primary lateral veins. It is distinguished by its ovate leaf blade; cuneate to truncate base; apiculate apex; revolute margins; and spongy texture. Diagnostic features include a crista along the entire midrib, 8–14 deeply impressed lateral veins, a white lobed ovary, and a markedly shorter peduncle (1.5–4.5 mm). A morphological description, illustration, and comparative notes with *H. cristata* are provided.

Keywords: Araceae, Chamaecladon, Malesia, ornamental, Sumatra.

INTRODUCTION

Homalomena of Sumatra represent a highly promising area for further exploration and taxonomic classification. As of now, a total of 38 species have been documented from the Sumatran region (POWO 2024; Irsyam et al. 2025a; Irsyam et al. 2025b). Recent studies have concentrated on the *Homalomena* species within the 'Chamaecladon Super Group' (Ng et al. 2011). Over the past twelve years, many novel species within this group were described from the island (Boyce and Wong 2012, 2013, 2016a, 2016b; Wong et al. 2020; Irsyam et al. 2025a, 2025b).

In July 2024, our observations led to the identification of a previously unrecorded mesophytic species of *Homalomena* from Jambi Province. By November 2024, it was discovered that this species had been circulating for a period as an ornamental plant on social media, commonly referred to as *Homalomena* "Renda". Upon closer examination, the species was found to exhibit several distinctive morphological traits that set it apart from other *Homalomena* species from Sumatra, notably *H. cristata* Alderw. (Alderwelt 1922). This manuscript provides a formal detailed taxonomic description of this newly recognized novel species.

MATERIALS AND METHODS

The morphological observation of the species was conducted at a private nursery in Bogor between July 2024 and January 2025. Additional specimens corresponding to the new species were examined at the Herbarium Bogoriense (BO). The analysis focused on the morphological characteristics, and detailed documentation of its inflorescences was carried out using a Dinolite digital microscope in National Research and Innovation Agency (BRIN), Cibinong.

TAXONOMIC TREATMENT

Homalomena renda A.S.D.Irsyam & M.R.Hariri, **sp. nov.** (Figure 1).

Type: cultivated in a private nursery from material collected in the wild ex Indonesia, Sumatra, Jambi, Merangin District, Tiang Pumpung (*orig. coll.* 12 July 2024, *AA Setiawan s.n.*), 19 December 2024, *M.R.Hariri 795* (holotype FIPIA, isotype BO).

Diagnosis

Most similar to *H. cristata* (Fig. 2) by cristate petioles, leaf blade margins, and peduncle, but differs in the following characters: sheath ca. 1/5 the petiole length (vs. 1/3–1/2), leaf blade ovate (vs. obovate-lanceolate), leaf base cuneate to subcordate or truncate (vs. rotundate-cuneate), margin revolute (vs. flat), leaf apex apiculate (vs. acuminate), leaf texture spongy (vs. subcoriaceous), crista present along the entire midrib (vs. restricted to basal 1/3), 8–14 primary lateral veins (vs. 3–4), primary lateral veins deeply impressed adaxially (vs. obscure), primary lateral veins cristate (vs. not cristate), intercostal regions conspicuously raised (vs. flat to slightly sunken), peduncle 1.5–4.5 mm long (vs. 1.5–2 cm), ovary white (vs. green).

Description

Mesophytic herbs, ca. 22.5 cm in height, forming leaf rosettes. *Stem* highly condensed, 2.0–5.5 cm long; internodes obscured by overlapping leaf bases. *Leaves* 6–8 per crown; *sheath* fully adnate to petiole, 1.7–4.2 cm long, margin revolute, apex truncate, yellowish-green to greenish-red brown; *petiole* long, 4.0–18.5 cm long, canaliculate, green above, reddish-green below, with up to 10 longitudinal cristae; *leaf blade* asymmetric ovate, 7.2–16.4 × 4.6–10.5 cm, base cuneate or subcordate to truncate, margin crispulate, revolute, apex apiculate, spongiosus, adaxial leaf surface yellowish-green to dark green, abaxial leaf surface green to reddish-green, midrib pale-green, raised abaxially, cristate abaxially; primary lateral veins 8–14 on each side, deeply impressed adaxially, cristate abaxially; intercostal region conspicuously raised. *Inflorescences* erect-spreading, 1–2 together; peduncle 1.5–4.5 mm long, reddish, cristate. *Spathe* oblong with asymmetric apex, without constriction, 17.7–19.2 × 4.5–5.1 mm, reddish dark green to reddish, apex blunt with a mucro to 1.5–2.6 mm long. *Spadix* sessile, 14.5–15.9 mm long, fertile to tip; *pistillate flower zone* cylindric, 3.8–5.4 mm long, shorter than the male zone; pistils few, in 5–6 whorls, lobed, 0.6–0.8 mm in height, 0.5–1.5 mm in diam., white, stylar region white; stigma sessile, button like, 0.2–0.5 mm in diam., white and turning black after anthesis; *staminode* 1 each pistillate flower, irregular in shape, sessile, ca 0.5 mm in height, 0.1–0.4 mm in diam., white; *staminate flower zone* conic, 10.1–10.3 mm long, apex acute; *staminate flowers* densely arranged, 1.2–1.8 mm long, consisting of 2–3 stamens, trapezoid to hexagonal in plan view, creamy white. *Fruits* and seeds not observed.

Etymology

The specific epithet *renda* is derived from the Indonesian language, where it refers to the term *crista*. This name highlights a defining characteristic of the species, emphasizing the distinct ridges or crests present on the plant.

Vernacular name

In Indonesia, this species is commonly marketed and sold under the local name *Homalomena* 'Renda'. This name is widely used among plant enthusiasts, horticulturists, and sellers, particularly in nurseries and plant markets.

Distribution and ecology

This species is endemic to Jambi, Sumatra and only known from the type locality.

Proposed conservation assessment

The species is currently classified as *undetermined* based on the criteria outlined by the IUCN Red List. Given the scarcity of available data, it is appropriate to categorize it as Data Deficient (DD). However, within its type locality, *H. renda* appears to face significant risks of overexploitation. This highlights the need for a comprehensive assessment of its conservation status to ensure proper measures are taken to protect the species.

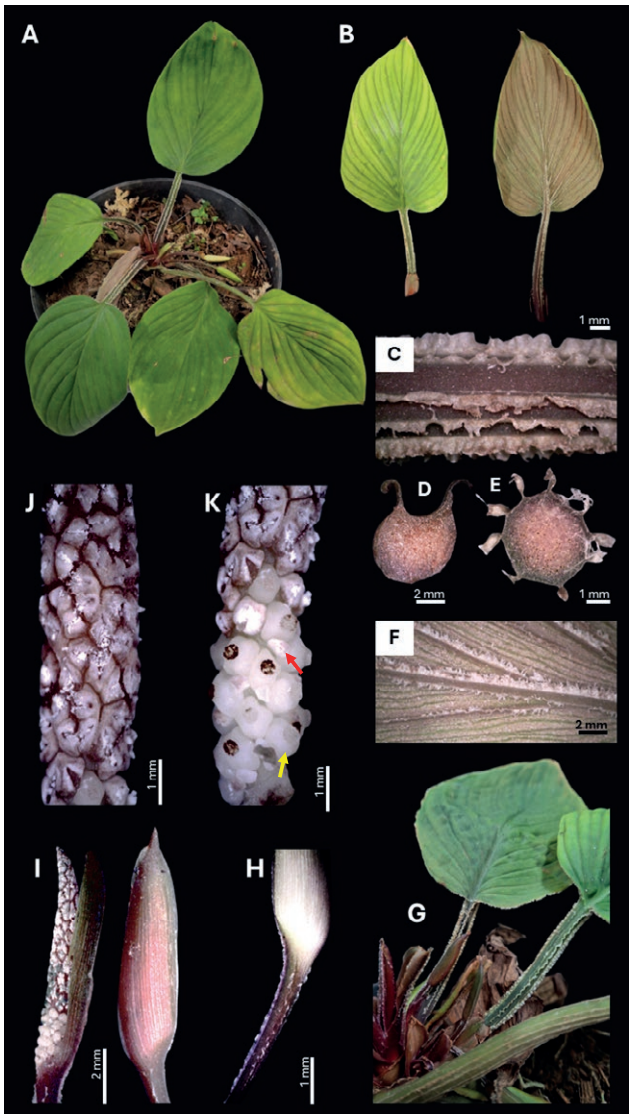

Figure 1. *Homalomena renda*. A. Habit; B. Adaxial and abaxial leaf surfaces; C. Cristate petiole; D. Cross section of petiole with sheath; E. Cross section of petiole showing cristae; F. Abaxial surface leaf showing veins cristae; G. Inflorescence; H. Cristate peduncle; I. Inflorescence with full and half of spathe removed artificially; J. Staminate flowers; K. Pistillate flowers with lobed ovary (yellow arrow) and staminodes (red arrow).

Notes

Homalomena renda is placed within the 'Chamaecladon Super Group' based on its distinctive morphological characters. Key diagnostic features include a non-constricted spathe, the presence of 2–3 stamens per staminate flower, and the occurrence of staminodes within the pistillate zone.

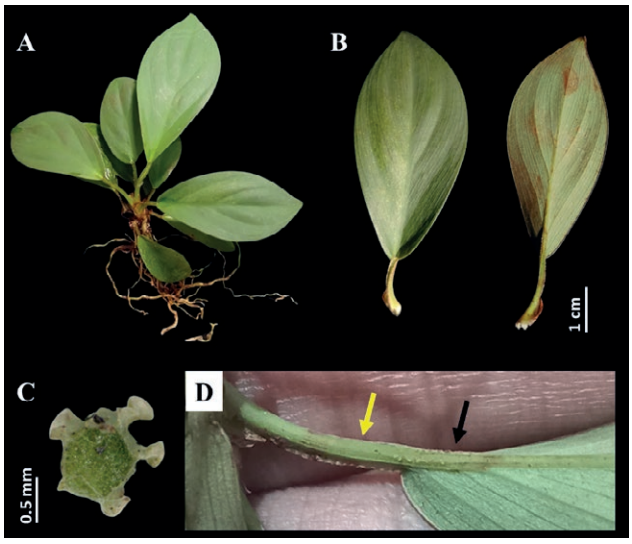

Figure 2. *Homalomena cristata*. A. Habit; B. Adaxial and abaxial leaf surfaces; C. Cristae on petiole; D. Cristae extending from base to mid-petiole (black arrow), fading distally (yellow arrow).

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Taxonomic novelties and nomenclatural notes on *Coccoloba* sect. *Coccoloba* (Polygonaceae) from Mexico and Central America

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Abstract. *Coccoloba* is one of the richest tropical tree genera of Polygonaceae. Since the last taxonomic treatment of the genus in 1959, new species and new nomenclatural arrangements have been published in the last decade. In this work, *Coccoloba ruizii* and *Coccoloba queretaroensis* are described and illustrated as two new endemic species from Mexico. The names *Coccoloba browniana*, *Coccoloba petenensis* and *Coccoloba wercklei* are resurrected based on morphological characters. In addition, to stabilize the taxonomy in *Coccoloba barbadensis*, neotypes are proposed for the names *Coccoloba barbadensis* var. *mexicana* and *Coccoloba leptostachya*.

Keywords: Central America, *Coccoloba*, Mexico, Polygonaceae, Taxonomy.

INTRODUCTION

Coccoloba P.Browne is the richest genus of tropical trees and shrubs within the Polygonaceae (Howard 1959a, b, 1961; Melo 2004; Burke and Sanchez 2011; Ortiz-Díaz and Ancona 2023). The presence of an ochrea, small flowers with 5 tepals, 8–10 stamens and achene embedded in the tepals, and/or the expanded hypanthium are the diagnostic characteristics of *Coccoloba* (Melo 2004; Burke et al. 2010; Ortiz-Díaz and Ancona 2025). The genus is native and widely distributed in the Neotropics, recognizing four regions with high species richness and endemisms (Koenemann and Burke 2020): Mesoamerica, The Antilles, Amazonia and Southestern Brazil. Recent phylogenetic analyzes of the subfamily Eriogonoideae have shown the monophyly of the *Coccoloba* and *Neomillspaughia* Blake placed as a sister to the genus, which together with *Podopterus* Bonpl. form the Coccolobeae tribe (Burke et al. 2010; Burke and Sanchez 2011; Koenemann and Burke 2020). However, infrageneric classification of the sections remain untested. The only monographic study of *Coccoloba* was carried out by Lindau in 1891, who

recognized 125 species, but more recent studies estimate the number of species from 120 to 150 (Howard 1961; Melo 2004; Acevedo-Rodríguez and Strong 2012; Hernández-Ledesma et al. 2015; Koenemann and Burke 2020).

In Lindau's treatment of *Coccoloba* (1891), the genus was classified into four sections, which are still recognized by morphology: *Coccoloba* sect. *Rhigia*, *C.* sect. *Paniculatae*, *C.* sect. *Campderia* and *C.* sect. *Coccoloba*, estimating 80 % of all species are including in the last one. The section *Coccoloba* includes species with racemiform and spiciform inflorescences; absence or reduction of ochreoles and acrosarcum fruit, meaning that the achene is covered by a fleshy or succulent accrescent exocarp derived from the perianth receptacle.

As part of the taxonomic study of *Coccoloba* species from Mexico and Central America, some specimens were observed that do not correspond to the previously described species within the section *Coccoloba* and are here proposed as two new species. In addition, the review of specimens of *Coccoloba acapulcensis* Standl. and *C. barbadensis* Jacq. throughout their distribution area allowed us to recognize and resurrect three names that were previously considered synonyms of these two species. Therefore, the objective of this work is to describe, illustrate and map the distribution of two new *Coccoloba* species for Mexico and to resurrect the names *C. browniana* Standl., *C. werkclei* Standl. and *C. petenensis* Lundell as species. The morphological characters of these resurrected species are compared with *C. acapulcensis* and *C. barbadensis*, that were previously considered synonyms.

MATERIALS AND METHODS

The study was conducted at Herbarium UADY of the Universidad Autónoma de Yucatán. During the review of herbarium specimens for the taxonomic treatment of the genus *Coccoloba* for Mexico and Central America, more than 550 specimens deposited in the BM, CICY, IEB, MEXU, MO, NY, UADY and XAL herbaria (acronyms follow Thiers 2025) determined as *Coccoloba acapulcensis* and *C. barbadensis,* were examined. All type specimens of the species listed above and their synonyms were consulted, as well as the general collections housed in virtual herbaria, including those maintained by JSTOR Global Plants (plants.jstor.org), Red de Herbarios del Noreste de México (herbanwmex.net), speciesLink (specieslink.net) and National Autonomous University of Mexico (MEXU; datosabiertos.unam.mx/biodiversidad). Specialized taxonomic literature on *Coccoloba* was consulted; in particular, Howard (1959a, b), Lindau (1891), Melo (2004) and Ortiz-Díaz and Ancona (2025). Additionally, the International Plant Names Index (www.ipni.org), and Tropicos (tropicos.org) were consulted to update the current nomenclature and geographical information.

The distribution map was created in QGIS 3.4 using the geographic coordinates of the herbarium labels recorded in the field by the collectors. The conservation status of the new species was assessed using the International Union for Conservation of Nature (IUCN) Red List Criteria (IUCN 2012; IUCN Standards and Petitions Committee 2024). We relied on criterion B, geographical distribution assessed both as B1/EOO (extent of occurrence) or B2/AOO (area of occupancy), as implemented in GeoCAT software (Bachman et al. 2011). The GeoCAT tool estimated the extent of occurrence (EOO) and its area of occupancy (AOO) of the new species based on 2 × 2 km cells.

TAXONOMIC TREATMENT

Coccoloba acapulcensis and allies

Coccoloba acapulcensis was described by Standley (1920: 66) with the specimen *Palmer 399*, collected in Acapulco, Guerrero. Standley mentioned that this species is markedly different from other *Coccoloba* species from Mexico and Central America by its peltate leaves. Standley (1927: 4) described later *Coccoloba browniana* with the specimen *S.J. Record & H. Kuylen 54* (US) collected in Honduras. In the protologue Standley remarked that it is an unusually well-marked *Coccoloba*, easily recognized among the Central American species by its broad cordate leaves, short racemes, and very large fruit. In 1929, Standley described *Coccoloba wercklei* with the specimen *C. Werckle s.n.* (US) collected in Costa Rica. Standley compares this new species with *C. browniana* and mentions that differs from *C. wercklei* by having shorter pedicels, less than 5 mm (vs. pedicels >10 mm). Finally, Standley describes *Coccoloba cardiophylla* and mentions that it is a very different species from other *Coccoloba* species from Mexico, but does not compare it with previously described species.

Almost a decade after the publication of *C. cardiophylla*, Lundell (1939) placed this name as a synonym of *C. browniana* and mentioned the affinities of this species with *C. acapulcencis* and *C. wercklei* such as the short raceme, long pedicels and large fruits, characteristics that differentiate them from other species of *Coccoloba* from Mesoamerica. Later, Howard (1959) in the study of Mexican and Central American species of *Coccoloba*

Table 1. Character comparison between *Coccoloba acapulcensis* and allies.

Character	State of character	*C. acapulcensis*	*C. browniana*	*C. werkclei*
Leaf blade	Shape	Orbicular, rounded or broadly ovate	Ovate, elliptic or oblanceolate	Ovate, elliptic or oblanceolate
	Texture	Chartaceous	Membranaceaous	Membranaceaous
	Base	Peltate (strictly)	Cordate	Cordate
	Apex	Rounded to slightly emarginate	Apiculate or acuminate	Apiculate or acuminate
Pedicel	Length (mm)	11–14	5–7	12–17
	Diameter (mm)	1.8–2.1	1–1.4	1.8–2.1
	Texture	Lignified	Herbaceous	Lignified
Fruit	Length (cm)	>2	1–1.5	>2
	Shape	Ovoid	Globose	Ovoid
	Base	Rounded	Rounded	Abruptly contracted

placed *C. browniana, C. cardiophylla* and *C. wercklei* as synonyms of *C. acapulcensis*. In this work we do not agree with Howard's conclusions (1959), but we do agree with Lundell's conclusion in recognizing three species: C. *acapulcensis*, C. *browniana* and C. *werkclei*. Table 1 and Figure 1 present the comparison among the diagnosable characters to delimit the three species.

Taxonomy

Coccoloba acapulcensis Standl. Proc. Biol. Soc. Washington 33(12): 66–67. 1920. (Figures 1A-C).

Type: MEXICO. Guerrero: vicinity of Acapulco, Oct 1894-Mar 1895, *Palmer 399* (holotype US!).

Distribution

This species is endemic to Mexico, distributed in the states of Guerrero and Michoacán (Fig. 2).

Coccoloba browniana Standl**.** Trop. Woods 10: 4–5. 1927. (Figs. 1D-F).

Type: HONDURAS. Collected in the dry region of Olanchito, 14 Feb 1927, S. *J. Record & H. Kuylen 54* (holotype US!).

(=) *Coccoloba cardiophylla* Standl. Publ. Field Mus. Nat. Hist., Bot. Ser. 8(1): 8. 1930.

Type: MEXICO. Yucatán [without locality], 1917-1921, *G. F. Gaumer 24013* (holotype F!).

Distribution

This species is distributed in Mexico (Campeche, Chiapas, Guerrero, Oaxaca, Puebla, Quintana Roo and Yucatan), Belize, El Salvador, Guatemala and Honduras (Fig. 2).

Coccoloba wercklei Standl. Publ. Field Mus. Nat. Hist., Bot. Ser. 4(8): 304. 1929. 1932[1930]. (Figures 1G-I).

Type: COSTA RICA. El Coyolar, 150 m, Jan 1912, *C. Werckle s.n.* (holotype US!).

Distribution

This species is endemic to Costa Rica (Fig. 2).

Coccoloba petenensis and allies

The synonymy of *Coccoloba barbadensis* Jacq. has already been discussed by Howard in several papers (1956, 1959b, 1992), we agree with all the proposed synonyms except for the name *Coccoloba petenensis* Lundell. *Coccoloba petenensis* was described by Lundell and he discussed its morphological affinity with *C. barbadensis*: the close affinity of *C. petenensis* with *C. barbadensis* is obvious, *C. petenensis* can be distinguished by its racemose inflorescences, pedicels up to 3 mm long, substipitate fruits that are narrow rather than rounded at the base, and obtuse apically (Fig. 3). In his revision of *Coccoloba* species from Mexico and Central America, Howard (1959b) assigned the specimens collected by Steyermark (*Steyermark 44899, 46040, 46160,* and *46224*) from Petén and Alta Verapaza, Guatemala, to *C. barbadensis*, with the following statement: they probably represent a hybrid complex. In this work, we observed these specimens and recognized them as *C. petenensis*. Later, Howard (1992) mentioned that he was able to observe authentic *C. petenensis* material and concluded that it belongs to the morphological variation of *C. barbadensis* and recognized the name as a synonym. However, in this work, we agree with Lundell in considering *C. petenensis* as an independent species.

Coccoloba barbadensis var. *mexicana* was described by Meisner (1856: 153) from the specimen *Schiede 1151*

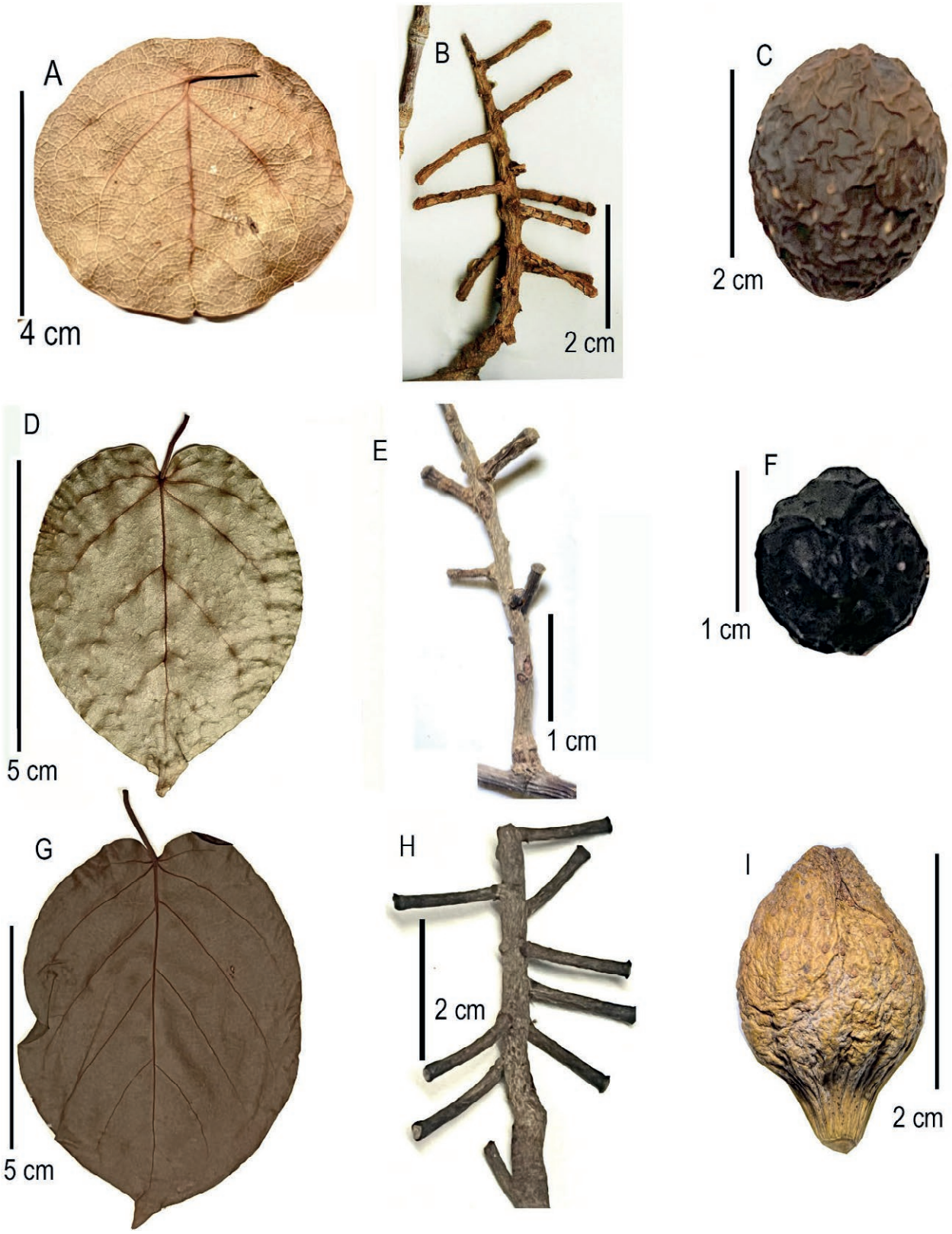

Figure 1. Morphological comparison between *Coccoloba acapulcensis* (A-C), *Coccoloba browniana* (D-F) and *Coccoloba werkclei* (G-I): A, D and G) abaxial surface of the blade; B, E and H) Pedicel; C, F and I) Fruit acrosarcum.

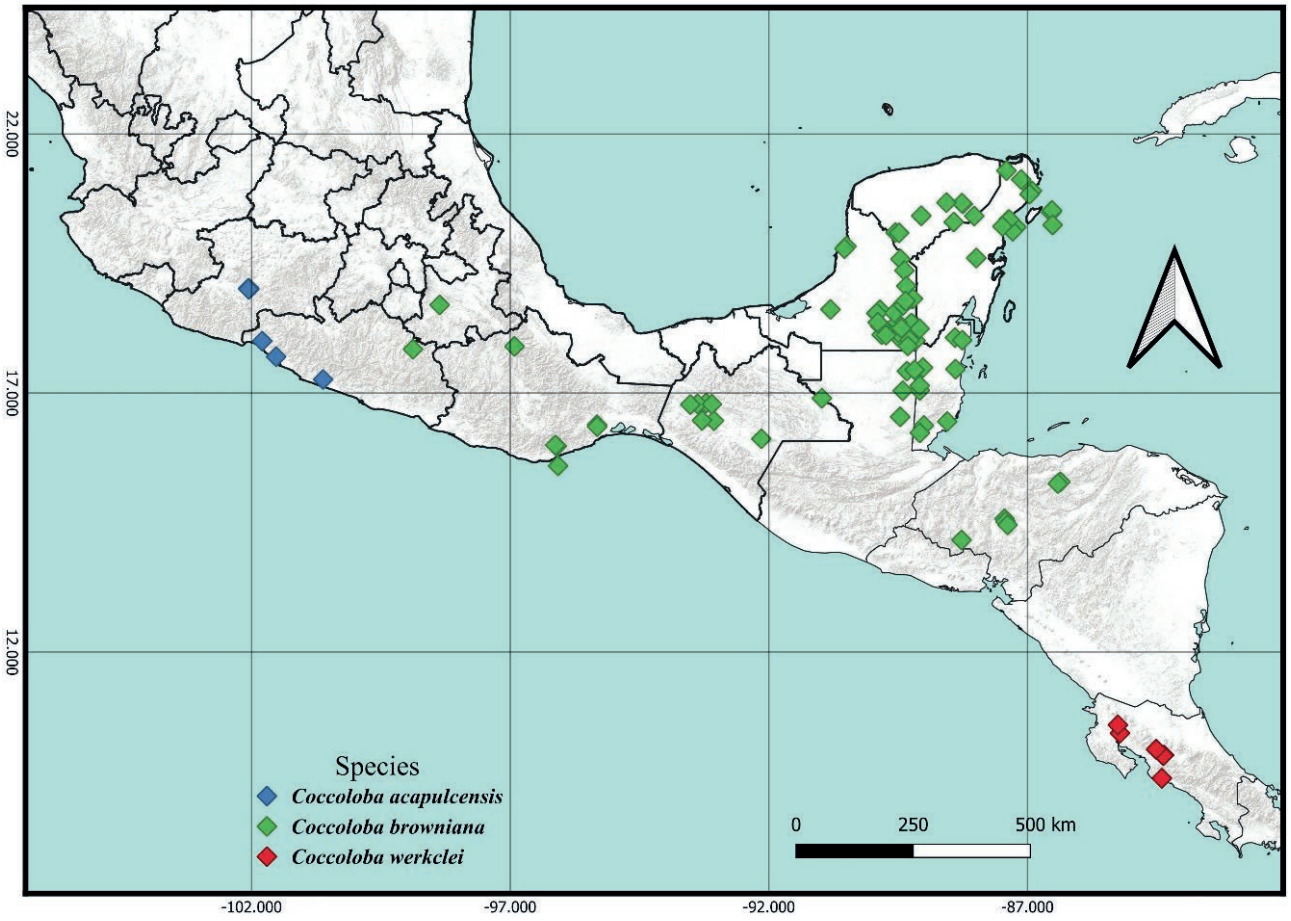

Figure 2. Distribution map of *Coccoloba acapulcensis*, *Coccoloba browniana* and *Coccoloba werkclei*.

deposited in the herbarium ZE Botanischer Garten und Botanisches Museum, Freie Universität Berlin (B). However, this specimen was not located. Later Lindau (1891) described the new species *C. schiedeana*, citing the Meisner variety as a synonym and the specimens *Schiede 1151, Liebmann sn., Karwinsky 734,735, 735b, Galeotti 7218* and *Wawra 44* without designating the holotype. In Herbarium B, there is another Schiede specimen without a collection number (*Schiede s/n*, barcode B10 0248247), with annotations by Lindau, which Howard (1959) later selected as the lectotype of the name. It is possible that the collection number has been lost, or that it is another specimen that Lindau did not mention in his species description. Therefore, since this specimen is not listed among the syntypes, we propose it in this work as the neotype of the name *C. barbadensis* var. *mexicana* and its synonym *C. schiedeana*.

Coccoloba leptostachya was described by Bentham (17846: 159) without reference to any specimen or illustration. Richard Howard (1959a) found the specimen *Barclay s/n* (K!) claiming that it is the original material observed by Bentham. He also confirmed that it is indeed the same as *C. barbadensis*, thus making the name *C. leptostachya* a synonym of *C. barbadensis*. In the NY herbarium, Michael Nee located another Barclay specimen (*Barclay 1125*) noting on the label that it is probably an isotype of *C. leptostachya*. Another problem associated with *C. leptostachya* is the origin of the observed material; the protologue mentions it as a species from La Libertad, Colombia, but this is an error. Currently, *C. barbadensis* is known to be a Mesoamerican species. Although the *Barclay s/n* label only indicates the locality "La Libertad", the *Barclay 1125* label describes the locality as "La Libertad, El Salvador", so we assume that these specimens were collected in El Salvador. Considering that Bentham did not mention any specimen in the protologue, we propose specimen *Barclay s/n* (K) as the neotype of the name *C. leptostachya* according to Art. 9.10 of ICN (Turland et al. 2018).

Taxonomy

Coccoloba petenensis Lundell Wrightia 3(7): 117. 1965. (Figs. 3A-D).

Type: Guatemala. Petén: Río Petexbatun, between Sayaxche and Laguna Petexbatun along riverbank, 4 Feb 1964, *C.L. Lundell 17669* (holotype LL).

Distribution

This species is distributed in Guatemala and Chiapas (Fig. 4).

Coccoloba barbadensis Jacq., Enum. Syst. Pl. 37. 1760. (Figure 3E-H).

Type: Mexico. Yucatán: Champotón, km 15 carretera Uayamon-Seybaplaya, 4 Jun 2003, *M.E. Magaña 950* (Neotype designated by Ortiz-Díaz & Ancona 2025: UADY!).

(=) *Coccoloba barbadensis* var. *mexicana* Meisn. Prodr. 14(1):153. 1856.

(=) *Coccoloba schiedeana* Lindau, Bot. Jahrb. Syst. 13(2): 187. 1890.

Type: Mexico. Veracruz: Papantla, *Schiede s/n* (designated by Howard 1959a as "holotype", here corrected to neotype according to the Art. 9.10 of ICN: B100248247!).

(=) *Coccoloba leptostachya* Benth., Bot. Voy. Sulphur. 159. 1846.

Type: El Salvador. La Libertad, *G. W. Barclay 1125* (designated by Howard 1959a as "holotype", here corrected to neotype according to the Art. 9.10 of ICN: NY00285686!).

(=) *Coccoloba jurgenseni* Lindau, Bot. Jahrb. 13: 188. 1890.

Type: Mexico. Oaxaca: *C. Jürgensen 157* (holotype G!, isotypes, F!, K!).

(=) *Coccoloba oaxacensis* H. Gross, Repert. Spec. Nov. Regni Veg. 12(322-324): 219-220. 1913.

Type: Mexico. Oaxaca: in der Umgebung von Rincón San Antonio auf dem Isthmus von Tehuantepec, 09 October 1906, *R. Endlich 1370* (holotype B!).

(=) *Coccoloba mayana* Lundell, Bull. Torrey Bot. Club 64 (8): 547-548. 1937.

Type; Guatemala. Departament of Peten: collected on the bank of the Rio San Pedro de Martir above El Paso, April 17, 1932, *C. L. Lundell 1498* (holotype MICH; isotypes CAS, GH, LL, NY, U, US).

(=) *Coccoloba masonii* Lundell, Lloydia 2(2): 84. 1939.

Type: Mexico. Collected on Maria Magdalena Island, in the Tres Marias Islands, 21 May 1925, *H.L. Mason 1806* (holotype F!, isotypes MICH!, NY!).

(=) *Cocoloba fluviatilis* Lundell, Contr. Univ. Michigan Herb. 7: 8. 1942.

Type: Mexico. Chiapas: Malpaso, near Siltepec, Elevatione 1000 m, Riverside, July 21 1941, *E. Matuda 4517* (holotype MICH!).

Distribution

Coccoloba barbadensis has wide distribution in Mexico, Belize, Guatemala, El Salvador and Honduras.

New species

Coccoloba queretaroensis J.J. Ancona, P.Hern.-Led. & J.J. Ortiz-Díaz, **sp. nov.** (Figure 5).

Type: Mexico. Querétaro: municipio Landa de Matamoros, cañón del río Estórax cerca de las adjuntas del río Moctezuma, elev. 700 m, 18 Nov. 2000, *E. Pérez-Calix et al. 4112* (holotype IEB!; isotype MEXU!).

Diagnosis

Coccoloba queretaroensis is similar to *Coccoloba burkeae* J.J. Ancona, J.J. Ortiz-Díaz & J. Tun, distinguished by shorter petioles, 7–9 (–11) mm, oblanceolate to lanceolate blades (vs petioles 12–15 mm, lanceolate to lanceolate-elliptic blades), racemiform inflorescence, acrosarcum 8–9 mm long, ovoid (vs spiciform inflorescence, acrosarcum 6–6.5 mm long, globose.

Description

Shurbs or trees hermaphrodites, 2–8 m tall; branches striate, glabrous; ochrea tubular, 3–5 mm, glabrous or puberulent. Leaves simple, alternate; petioles 7–9 (–11) mm long, 1.3–1.45 mm diameter, glabrous, arising at the base of the ochrea; leaf-blades 5–13 cm long, 2–5 cm wide, oblanceolate to lanceolate, coriaceous,

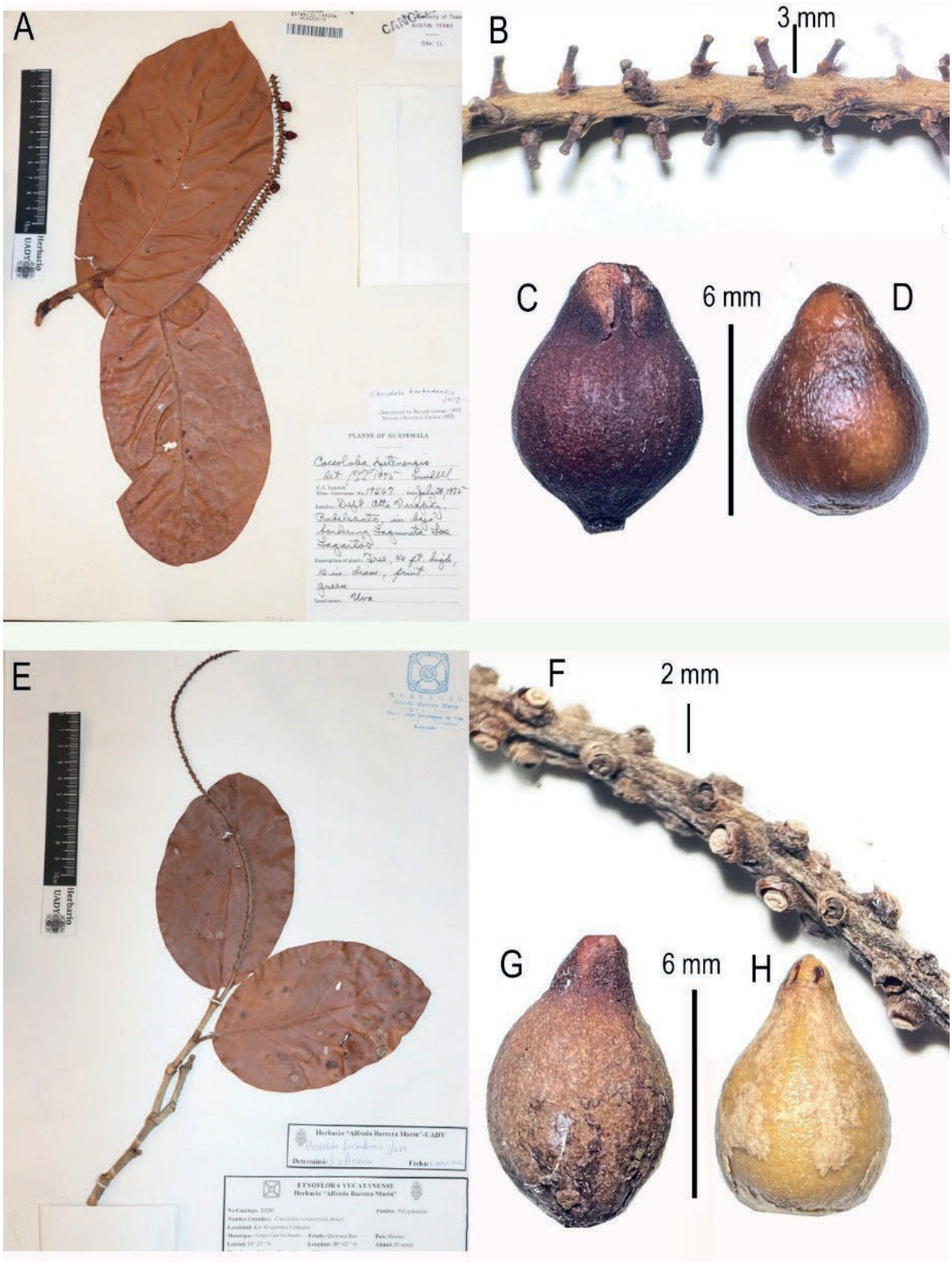

Figure 3. Morphological comparison between *Coccoloba petenensis* (A-D) and *Coccoloba barbadensis* (E-H): A and E) branch and inflorescence; B and F) details of the pedicels; C and G) acrosarcum fruit; D and H) achene.

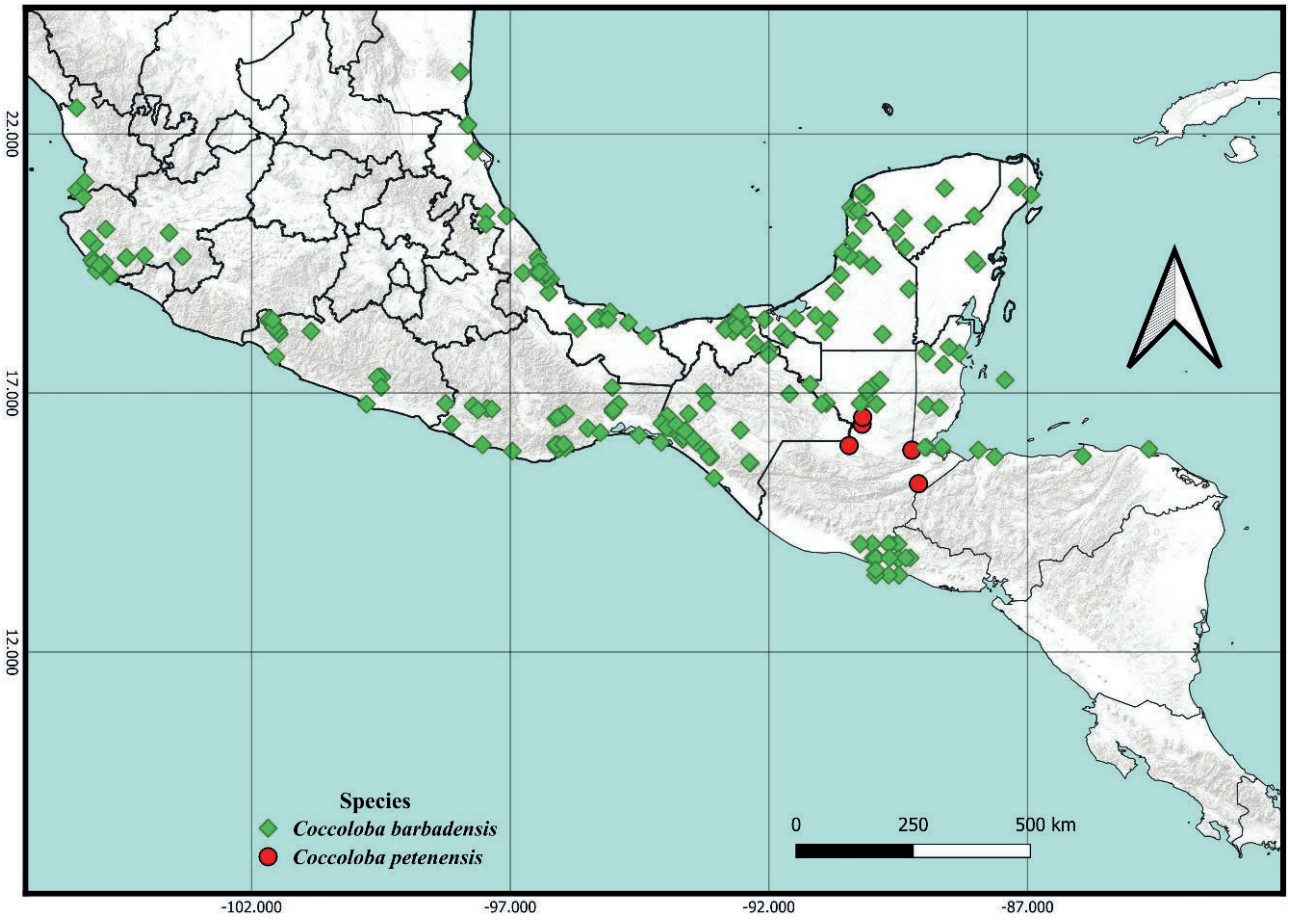

Figure 4. Distribution of *Coccoloba barbadensis* and *Coccoloba petenensis*.

glabrous on both surface, margin entire or undulate, base attenuate to cuneate, apex acute to short acuminate; venation brochidodromous and reticulate, 8–10 pairs of primary nerves. Inflorescence terminal, racemiform, 10-15 cm long, rachis striated, strongly rib-sided, puberulent; bracteole 0.2-0.5 mm long, cymbiform, membranaceous; ochreolae tubular, apex irregular, 1 mm long, membraneous, glabrous, yellowish; pedicels in flower 1.5–2 mm, pedicels in fruit 1.5–3 mm, thicker, glabrous or puberulent and pulverulent. Flowers in quincuncial aestivation, a single whorl, tepals imbricate, coriaceous; functionally male flowers 2–3 × fascicle, 2–2.5 mm; hypanthium 0.7–1 mm long, glabrous; tepals 1.2–1.5 mm long, glabrous; stamens 8, 2 mm long, filaments filiform 1.5 mm long, anthers 5 mm long; ovary 1 mm long, trigonous, glabrous, style 3, 0.5 mm long; flowers functionally female not seen. Fruit acrosarcum, 8–9 mm long, 6–7 mm diameter, ovoid, glabrous, base rounded, abruptly contracted at junction with pedicel, apex rounded to obtuse; hypanthium expanded, almost completely covering the achene, tepals persistent, coriaceous, appressed, covering the apex of the achene. Achene 6–7 mm long, 5–5.5 mm diameter, ovoid, base rounded or truncate, dark brown or black, apex tuberculate, depressed–galeate, slightly prominent.

Etymology

The specific epithet of this species refers to the state of Querétaro, the place where it lives and where it was collected.

Distribution and habitat

Coccoloba queretaroensis is endemic to Querétaro, Mexico. (Fig. 6). It inhabits seasonally dry forests, oak forests, and transition zones between oak forest and seasonally dry forest, at elevations of 250 to 850 m.

Phenology

Fruit collected from August to November; flowers collected from March to June.

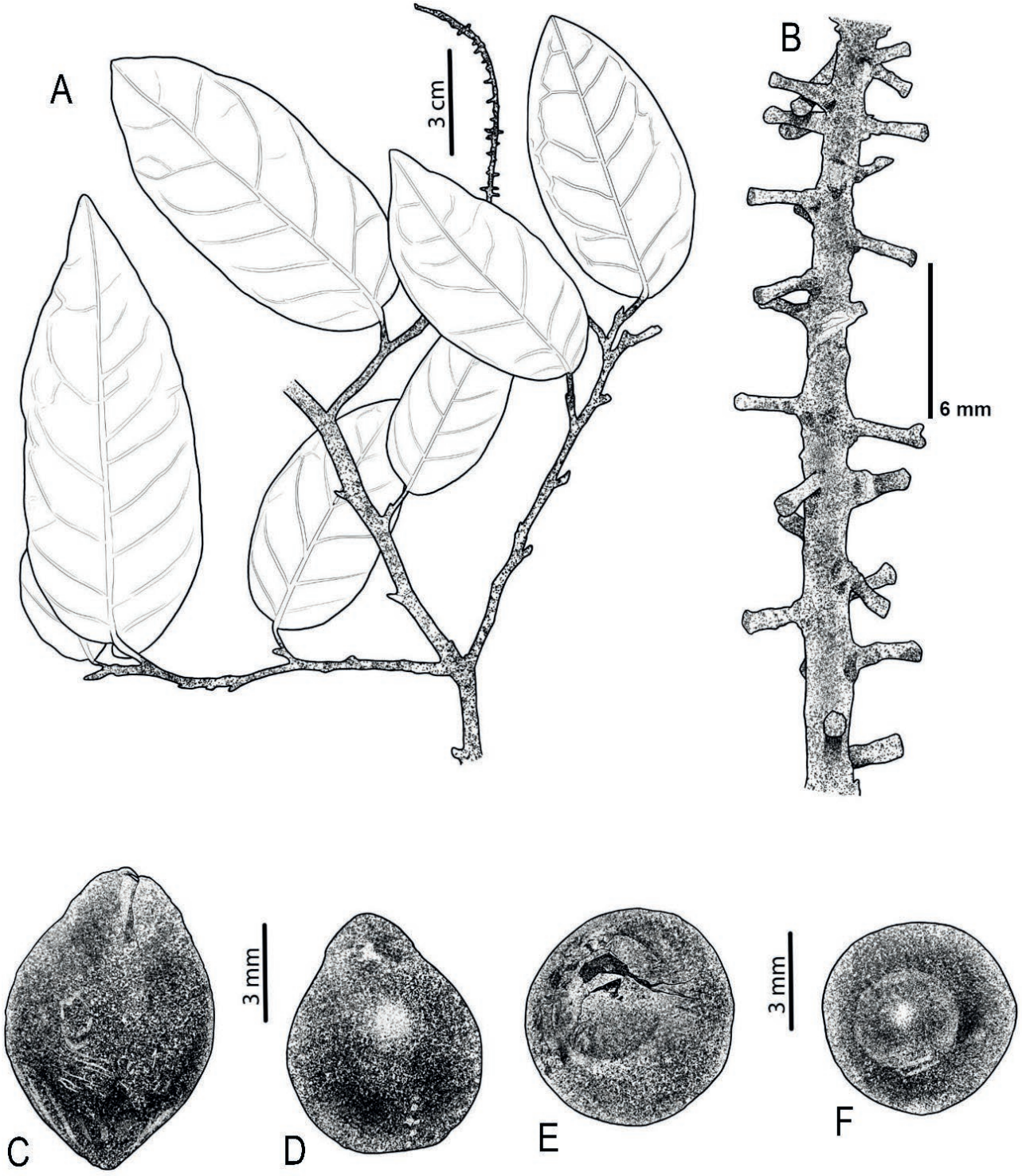

Figure 5. *Coccoloba queretaroensis* J.J. Ancona, P.Hern.-Led. & J.J. Ortiz-Díaz. A. Branch showing leaves and inflorescence. B. Inflorescence and pedicel. C. Acrosarcum lateral view. D. Achene lateral view. E. Acrosarcum polar view. F. Achene polar view. Illustrations by Eduardo Velázquez Echeverría.

Figure 6. Distribution maps of *Coccoloba queretaroensis* and *Coccoloba ruizii*.

Status of conservation

Coccoloba queretaroensis has an EOO of 128 km^2 and an AOO of 24 km^2, both values being below the thresholds of the Endangered (EN) category under criteria B1 and B2, respectively. Therefore, considering its small area of occupancy corresponding to 24 km^2, its presence extension of 128 km^2, six collection and one or two locations, it is established that *C. queretaroensis* is in a preliminary category of EN B1ab(iii)+2ab(iii) following the IUCN criteria.

Specimens examined

MEXICO. **Querétaro**: Mpio. de Landa, 8 km al sureste de Agua Zarca, sobre el camino a Pisaflores, 800 m, 13 Apr 1988, *Rzedowski 46362* (IEB); Mpio. de Landa, 8 km al sureste de Agua Zarca, camino al río Moctezuma, 600 m, 30 Oct 1990, *H. Rubio 2008* (IEB); Mpio. de Landa, a 2 km al sureste de San Juan, Los Tubos, 200 m, 12 Jun 1990, *H. Rubio 1806* (IEB, MEXU); Mpio. de Jalpan, 2-3 km al E de La Boquilla, S. L. P. junto al río Santa María 270-320 m, 10 Mar 1993, *E. Carranza y Cols. 4574* (IEB); Mpio. de Jalpan, 1-2 km al SW de El Embarcadero, 850 m, 16 Aug 1990, *E. Carranza 2655* (holotype IEB).

Coccoloba ruizii J.J.Ancona, P.Hern.-Led. & J.J.Ortiz-Díaz, **sp. nov.** (Figure 7).

Type: Mexico. Veracruz: Puente Nacional, El Hato, orilla del arroyo, elev. 450, 7 Apr 1973, *F. Ventura 8125* (IEB!).

Diagnosis

Coccoloba ruizii is similar to *C. tunii* Ortiz-Díaz & Arnelas, it is differentiated for narrow elliptic, coriaceous, abaxially glabrous, adaxially sparsely puberulous (vs elliptic to elliptic oblong or narrowly ovate, chartaceous, adaxially scarce to sparsely pubescent), acrosarcum ovoid, 6–6.5 × 5 mm, not glandular puntiform (vs globose 7–10 × 7–10 mm, glandular puntiform); achene globose, brown with apex yellowish (vs globose, brown or black).

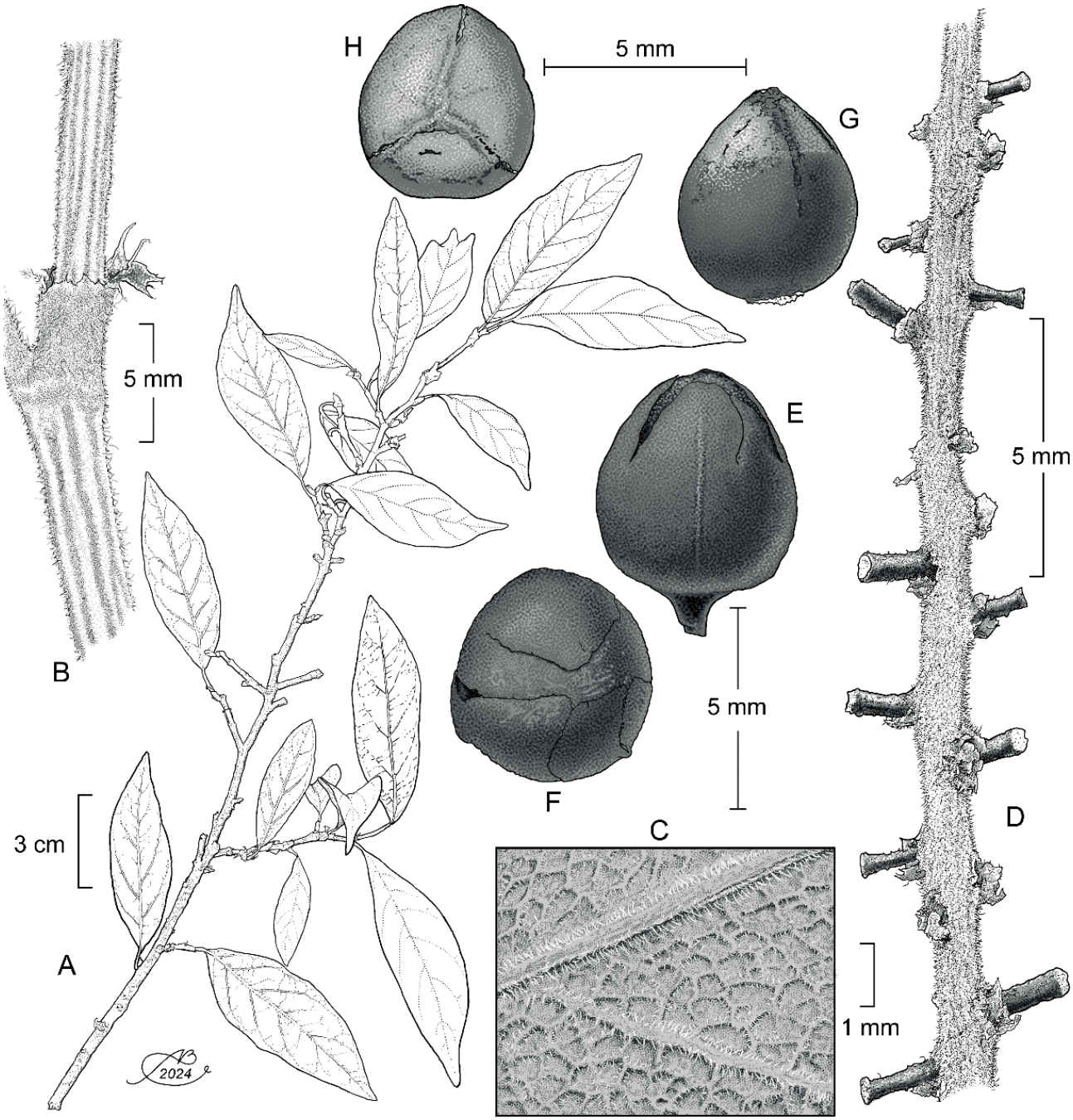

Figure 7. *Coccoloba ruizii* J.J. Ancona, P.Hern.-Led. & J.J. Ortiz-Díaz. A. Branch showing leaves and inflorescence. B. Ochrea. C. Abaxial surface of the blade. D. Details of the inflorescence . E. Acrosarcum lateral view. F. Acrosarcum polar view. G. Achene lateral view. H. Achene polar view. Illustrations by Alfonso Barbosa.

Description

Shurbs or trees hermaphrodites, 3–7 m tall; branches striate, glabrous; ochrea tubular, 3–5 mm, pubescent to densely hirsute, with yellowish trichomes. Leaves simple, alternate; petioles 5–9 (13) mm long, 1.3–1.79 mm diameter, pubescent to densely hirsute mainly in the adaxial part, with yellowish trichomes, arising at the base of the ochrea; leaf-blades 6–9(11) cm long, 2.5–3.5(4) cm wide, narrow elliptic, coriaceous, abaxially glabrous, adaxially sparsely puberulous, with yellowish trichomes, margin

entire, sparsely ciliate, apex acute to short acuminate, base attenuate to cuneate; venation brochidodromous and reticulate, 7–9 pairs of primary nerves, primary nerve densely pilose or pubescent, with yellowish trichomes. Inflorescence racemiform, terminal or axillar, laxiflorous, solitary, 3–6 cm long; rachis terete to angular, not ribbed, up to 1 mm diameter, striate, sparsely to densely puberulent and pulverulent, with yellowish trichomes; bracteole 0.5 mm long, cymbiform, black or dark brown, puberulent and pulverulent, apex acute; ochreola membranaceous, light brown, breaking irregularly, surrounding the pedicel, 0.5 mm long; pedicels in flower not seen, pedicels in fruit 1.2–1.5 mm, glabrous or puberulent and pulverulent. Flowers not seen. Fruit acrosarcum, 6–6.5 mm long, 5 mm diameter, ovoid to subglobose, glabrous, base rounded, abruptly contracted at junction with pedicel, apex rounded to obtuse; hypanthium expanded, almost completely covering the achene, tepals persistent, membranaceous, appressed, covering the apex of the achene. Achene 5 mm long, 4.5–5 mm diameter, globose, slightly 3-lobed, base rounded or truncate, brown, apex obtuse, yellowish, smooth, glossy.

Etymology

The specific epithet is in honor of Dr. Eduardo Ruiz Sánchez, Mexican botanist specialized in the taxonomy and systematics of Poaceae, especially the genus of Bamboo.

Distribution and habitat

Coccoloba ruizii is only known from the type locality (Figure 6). Habiting in high evergreen forest.

Phenology

Fruit collected in April.

Status of conservation

Currently, only the type locality of the new species is known, the specimen was collected in 1995 and there are no recent collections in herbaria. According to the IUCN red list criteria, the conservation status of the new species should best be classified as "Data Deficient (DD)". Of course, more research and broader field work is needed to locate new populations and establish some Red List category.

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A new species of *Cordia* sect. *Gerascanthus* P. Browne (Cordiaceae) to the Brazilian semiarid

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Abstract. A new species of *Cordia* (Cordiaceae) is described, *Cordia rosangelae* J.I.M.Melo, hitherto recorded exclusively in the Brazilian semiarid region. It can be readily recognised by its subcylindrical branches and, mainly, by its lax inflorescences, flowers with an obclavate calyx distinctly smaller than the corolla tube with a reddish stripe in the apical portion, corresponding to the extension of the lacinia, as well as by its corolla up to 5.0 cm long, unguiculate corolla lobes, flattened style, linear, with calluses stigmas and pyriform ovary. A distribution map with known occurrence records as well as data on the habitat, morphological diagnostic characters and reproductive phenology of the species are provided. A key to distinguishing *C. rosangelae* from the other species of *Cordia* sect. *Gerascanthus* from Caatinga domain is presented. In addition, the conservation status of *C. rosangelae* is preliminary assessed according to IUCN criteria and the species has been classified as Least Concern (LC).

Keywords: Boraginales, conservation, Cordiaceae, South America, taxonomy.

INTRODUCTION

Cordiaceae R.Br. ex Dumort. is distributed in almost all regions of the globe, representing a monophyletic group, morphologically supported mainly by its woody habit, bifurcated styles with four stigmatic branches, plicate cotyledons and drupaceous fruit, in addition to standing out as one of the most numerous families of the order, encompassing about 400 species in two genera, *Cordia* L. and *Varronia* P. Browne (Luebert et al. 2016).

There are currently 98 species of Cordiaceae recorded for Brazil, where it is represented in all phytogeographic domains and regions. However, of the total number of species associated to the Brazilian territory, 60 belong to the genus *Cordia* (30 spp. endemic) and 38 belong to the genus *Varronia* (23 spp. endemic) (Stapf et al. 2025 [continuously updated]).

The genus *Cordia* stands out for its pantropical distribution and for its approximately 250 species (Miller and Gottschling 2007), with the New World representing its main center of diversity (Taroda and Gibbs 1986a, b). Its species can be characterized by their shrubby to arboreal habit, flowers generally grouped in terminal multiflorous panicles, with a tubular-campanulate calyx, 3–5–lobed, and stamens ranging from 4 to 5, usually two shorter and two to three longer, villous at the base, and fruits ranging from conical to ovate, with vibrant hues, sometimes with a persistent calyx, constituting an important component in both xeric and humid vegetational formations.

During the 20th century (Johnston 1930; Taroda and Gibbs 1986a, b; Taroda and Gibbs 1987) and, especially, in the 21st century, studies were carried out with the aim of understanding the taxonomic diversity associated with the distribution of Cordiaceae in Brazil, including taxonomic treatments and synopses: Stapf (2007), Vieira et al. (2015), Melo et al. (2018), Melo and Vieira (2021), the revisional study by Silva (2021) and the monograph of Cordiaceae within the scope of "Flora and Funga of Brazil" (Stapf et al. 2025 [continuously updated]), new species discoveries (Guimarães et al. 2015; Melo and Vieira 2015; Silva and Melo 2018, 2022; Pedro-Silva et al. 2021; Silva et al. 2023) and a new record for the Brazilian flora (Melo et al. 2021).

However, new species have been described for other regions of South America: for Colombia (Fernández-Alonso and Melo 2021; Fernández-Alonso and Cogollo-Pacheco 2024) and Colombia, Ecuador and Peru (Miller et al. 2023), in addition to the recent publications of the Boraginaceae monograph for Argentinian flora (Simpson et al. 2022) and nomenclatural (Silva and Melo, 2019) or conservationist approaches (Pedro-Silva and Melo 2024).

During the preparation of the Cordiaceae treatment for the "*Flora of Alagoas, Brazil*" one of the representatives of *Cordia* could not be classified within the conceptual limits of the taxa previously recognized for the genus. In this perspective, a new species of *Cordia* belonging to the section *Gerascanthus* P.Browne, until then presenting distribution restricted to the semi-arid region (Caatinga) of the Northeastern Brazil is described and illustrated here; expanding the taxonomic diversity of this section that is exclusive to the Neotropical region associated especially to the dry habitats and their species are morphologically characterized mainly by its ribbed calyx.

MATERIAL AND METHODS

Morphological analysis

The comparative morphological analyses were carried out during two visits at the Instituto do Meio Ambiente do Estado de Alagoas Herbarium (MAC) in October and December/2024 and at the Manuel de Arruda Câmara Herbarium (HACAM, not indexed by Thiers (2025), based on specimens of the MAC collection, consultation of the study developed by Miller (2013) and POWO (2025) and SpeciesLink (2025) databases. Herbarium acronyms follow Thiers (2025).

The protologues, type specimens and other materials, including historical collections, of the species related to *C. rosangelae* were compared to or taken from GBIF (2025), JSTOR (2025) and Tropicos (2025) databases.

The descriptive terminology used by Hickey (1973), Radford et al. (1974), Payne (1978) and Hewson (1988) were adopted. The distribution map was produced using open source QGis 3.18 software (QGIS 2024). A preliminary conservation assessment was obtained by calculating the extent of occurrence (EOO) and the area of occupancy (AOO) with GeoCAT (Bachman et al. 2011) and applying the IUCN Red List Categories and Criteria (IUCN 2024). The AOO was calculated based on a user defined grid cell of km^2.

TAXONOMIC TREATMENT

Cordia rosangelae J.I.M.Melo, **sp. nov.** (Figure 1).

Type: Brazil, Alagoas: Água Branca, Refúgio da Vida Silvestre (RVS) do Craunã e do Padre, Pedra Montada, 19 Oct 2013 (fl.), *M.C.S. Mota et al.* 12247 (holotype MAC; isotype MAC).

Diagnosis

Cordia rosangelae is morphologically closer to *C. insignis*, a species widely distributed in South America (Brazil, Paraguay, and Bolivia) commonly associated with Cerrado vegetation, in general appearance and leaves, which can be distinguished by its subcylindrical branches and, mainly, by its lax flowers in the inflorescences with an obclavate calyx distinctly smaller than the corolla tube with a reddish stripe in the apical portion, that corresponds to the extension of the calyx lacinia, corolla up to 5.0 mm long, unguiculate corolla lobes, flattened style, linear, with calluses stigmas, and pyriform ovary (vs. slightly angular branches, congested flowers in the inflorescences, tubular calyx evidently

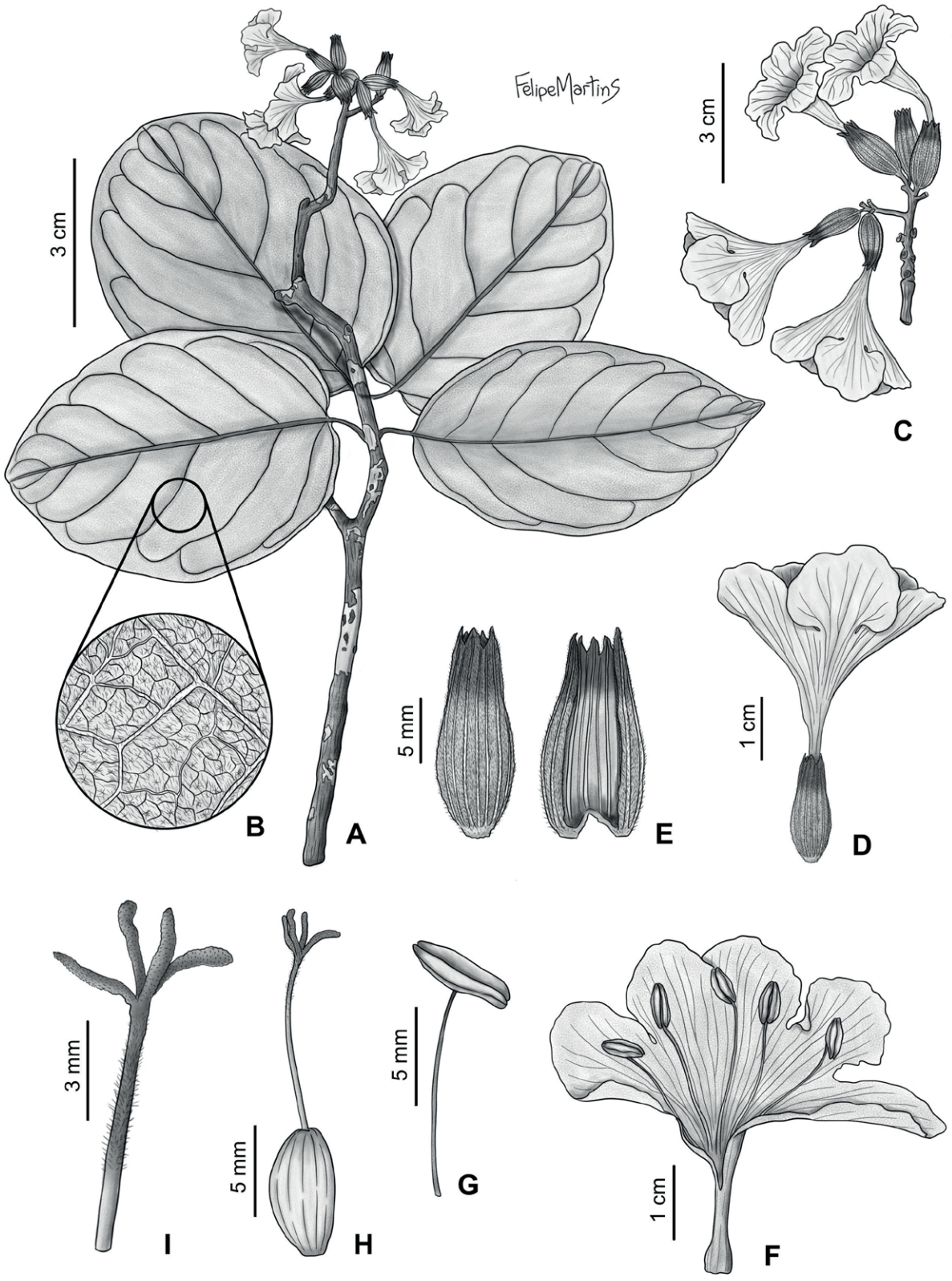

Figure 1. *Cordia rosangelae* J.I.M. Melo. A. Reproductive branch. B. Detail of the venation of the abaxial surface. C. Inflorescence. D. Flower. E. Calyx (outer and inner surface). F. Dissected corolla detaching the androecium. G. Stamen. H. Gynoecium. I. Style and stigmas. (Drawn by F. Martins from *Lyra-Lemos 5126* and *M.C.S. Mota et al. 12247*).

surpassing the corolla tube with the apical portion not having a different color from the rest of the calyx, corolla up to 4.2 cm in length, largely ovate to orbiculate corolla lobes, cylindrical style, clavate, not glandular stigmas, and ovoid ovary in *C. insignis*).

Description

Shrubs to trees, 2.5–6 m tall; subcylindrical branches, with intact rhytidome, glabrous. Leaves alternate, spiral, petiolate; petiole ca. 1 cm long, grooved, glabrescent, trichomes distributed mainly on the right and left margins; leaf blade 6.9–(7.4–7.8)–8.8 × 4.6–(4.9–5.9)–6.1 cm, chartaceous, ovate, broadly ovate to elliptical, base obtuse, margin entire, slightly revolute, ciliate, presenting whitish trichomes, discolor, adaxial surface with impressed veins, balled, glabrescent, sparse trichomes concentrated on the central and secondary veins, abaxial surface with prominent veins, aciculiform trichomes, brochidodromous venation, reticulate tertiary venation. Inflorescences racemes, 4.0–5.0 cm long, terminal, pedunculated, lax; peduncles 2.6–4.0 cm long in 1st order synflorescences, glabrescent, 0.6–1.0 cm long in 2nd order synflorescences, tomentose, rufescent. Flowers 4.1–5.1 cm long, sessile. Calyx up to 1.7 cm long, obclavate, costate, costa–3 per lobe, externally sericeous, internally tomentose in the median and terminal portions, 5–toothed, green to yellowish, apical portion presenting a reddish-brown band with up to 2.5 mm long corresponding to the extension of the lacinia, rufescent along its entire length; lacinia ca. 1.5 mm long, lanceolate. Corolla 4.0–5.0 cm long, infundibuliform, constriction 1.6–2.2 cm from base of tube, white to slightly brown, red when passed, marcescent; lobes 1.8 × 1.6 cm, suborbicular, with irregular or sometimes wavy margin, internally glabrous, externally hairy; tube 1.4–1.5 cm long, sericeous in the lower third. Stamens ca. 2.0 cm long, inserted ca. 1.3 cm from base of corolla; filaments ca. 1.4 cm long, slightly compressed, striate, villous at base; anthers ca. 5.5 mm long, laminar, oblong, cordate base, glabrous, cream, basifixed. Gynoecium up to 3.0 cm long; ovary up to 6.5 mm long, obpyriform, sparsely hairy, with short trichomes, basal disc ca. 0.5 mm high,

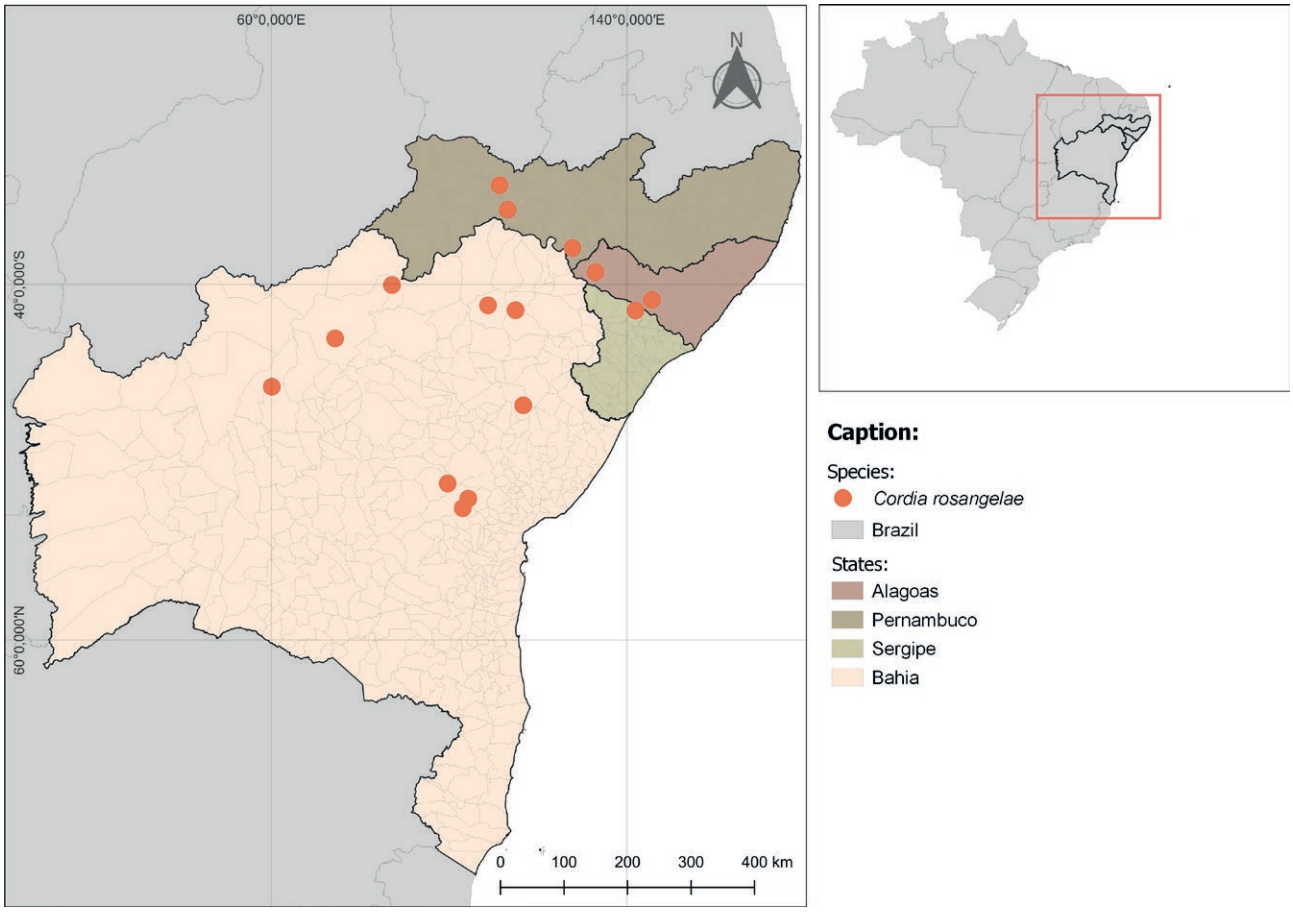

Figure 2. Currently known distribution of *Cordia rosangelae*.

annular; style 2.0–2.2 cm long, slightly compressed, hairy, with short sparse trichomes; stigmas up to 3.3 mm long, linear, ciliate margin, with calluses. Fruits not seen.

Etymology

The specific epithet refers to Rosângela Pereira de Lyra-Lemos, a Brazilian botanist who has inspired various generations of students in Alagoas state and in Brazilian Northeast as a whole. She is curator of the MAC herbarium, of the Instituto do Meio Ambiente do Estado de Alagoas (IMA), being also the project's coordinator "*Flora of Alagoas, Brazil*" and one greatest collector of plants.

Distribution, habitat, and phenology

Cordia rosangelae it is distributed in Brazilian Northeast in the states of Pernambuco, Alagoas, Sergipe and Bahia, associated to the Caatinga vegetation (Fig. 2). It was recorded in remnants near to the roadside (Alagoas state), lake shore (Bahia state) and near to granitic rock outcrops (Bahia state), in eutrophic lithic neosoil, constituting an occasional or rare element in the landscapes to which it is associated, at altitudes ranging from 397 to 680 m. Based on the northern and western limits of geographic distribution originally detected for *C. rosangelae*, it is expected that the species will be recorded in other states that constitute the semiarid region of Northeastern Brazil. Due to the arrangement of stamens and stigmas, it is suggested that this species is pollinated by bees. Specimens with flowers were recorded from June to November.

Assessment of conservation status

Specimens of *Cordia rosangelae* were recorded only in Caatinga vegetation areas, Brazilian Northeastern, including three municipalities in the state of Pernambuco (Cabrobó, Serrita and Petrolândia), two municipalities in the state of Alagoas (Água Branca and Batalha), in a single municipality of the state of Sergipe (Porto da Folha) and in nine municipalities of the state of Bahia (Araci, Canudos, Gentio do Ouro, Itaberaba, Itatim, Milagres, Sento Sé, Sobradinho and Mauá). Based on these records, the Extent of Occurrence (EOO) of the species is 178,339.712 km^2 and its Area of Occupancy (AOO) is 60.000 km^2. The species' population has few individuals at fifteen locations - all of which are threatened by a reduction in the width of the remnants, either by the expansion of urbanization or agricultural and livestock activities. *Cordia rosangelae* and the low number of individuals represents a threat of their survival and only two populations were found in Conservation Units, one of which is under state jurisdiction (Refúgio da Vida Silvestre (RVS) do Craunã e do Padre, Alagoas state) and one under federal jurisdiction (Parque Nacional Boqueirão da Onça, Bahia state). We propose a preliminary conservation assessment of *C. rosangelae* as Least Concern (LC), based on the IUCN criteria and guidelines (IUCN 2012; IUCN 2024), and as it has populations formed by few individuals, occurring so far only in these fifteen locations, and the projected continued decline in the AOO due to the continued degradation of its natural environments.

Comments and morphological affinities

In the herbaria consultation, *Cordia rosangelae* is erroneously identified as *C. insignis* or remains unidentified. However, *C. rosangelae* can be clearly differentiated from *C. insignis* by the shape of the branches, arrangement of the flowers in the inflorescences as well as by characters related to the calyx (shape, size and color), corolla (size and shape of the lobes) and by the gynoecium (shape of the style, shape and stigmatic surface) highlighted in the diagnosis section. Our results increase the number of *Cordia* sect. *Gerascanthus* representatives in the Brazilian flora to nine, of which eight species were previously known, as well as adding the new species to the Caatinga vegetation. Table 1 provides an overview of the morphological differences between these species. See also Fig. 1.

Identification key to the species of *Cordia* sect. *Gerascanthus* recorded in the Brazilian semiarid

1. Multiflorous inflorescences; subsessile to sessile flowers ... **2**
1. Pauciflorous or multiflorous inflorescences; exclusively sessile flowers ... **3**
2. Hirsute petiole; subsessile flowers; obovate corolla lobes with obtuse apex; stamens thickened in the median portion ... ***C. obtusiloba***
2. Glabrescent petiole; sessile flowers; truncate corolla lobes; stamens not thickened in the median portion ... ***C. trichotoma***
3. Pauciflorous inflorescences lax; obclavate calyx, with an apical portion presenting a reddish-brown band up to 2.5 mm long that corresponds to the extension of the lacinia; linear stigmas, with calluses ... ***C. rosangelae***
3. Multiflorous inflorescences congested; erect calyx, never with the above characteristics; stigmas with other shapes, plans ... **4**
4. Calyx ca. 1.5 cm long, tubular calyx evidently smaller than the corolla tube; corolla with oblong lobes; filiform stigmatic branches ... ***C. glabrata***

Table 1. Morphological and distribution comparisons of *Cordia rosangelae* and *C. insignis*.

Character	*Cordia rosangelae*	*Cordia insignis*
Distribution	Brazil (Caatinga)	Brazil, Paraguay, and Bolivia
Branches (shape)	subcylindrical	slightly angular
Inflorescence	pauciflorous, lax	multiflorous, congested
Calyx (shape)	obclavate, distinctly small than the corolla tube	tubular, evidently surpassing the corolla tube
Calyx (color)	presenting a reddish apical portion	entirely green to yellowish-brown
Corola (length)	up to 5.0 mm long	up to 4.2 mm long
Corolla lobes (shape)	unguiculate	largely ovate to orbiculate
Style (shape)	flattened	cylindrical
Stigmas (shape)	linear	clavate
Stigmas (surface)	with calluses	without calluses
Ovary (shape)	pyriform	ovoid

4. Calyx ca. 2 cm long, evidently surpassing the corolla tube; corolla with largely ovate to orbicular lobes; clavate stigmatic branches..... ***C. insignis***

Additional specimens examined (paratypes)

BRAZIL: **Alagoas:** Batalha, 9°45'37"S, 37°01'51"W, pequeno remanescente próximo à estrada, na borda da vegetação, Caatinga, 28 Oct 2000 (fl.), *R.P. Lyra-Lemos 5126* (MAC); **Bahia:** Araci, Fazenda Mulungu, margem de uma lagoa, 11°20'05"S, 38°57'18"W, 257 m, 28 June 2018 (fl.), *M.L. Guedes et al. 30553* (ALCB); Canudos, ca. 5 Km antes de Canudos, 9°54'52"S, 39°04'07"W, 12 Aug 2004 (fl.), *A.A. Santos, A.A. Conceição, F.H.F. Nascimento & J.B. Pereira 2442* (CEN, HUEFS); Gentio do Ouro, Caminho para Santo Inácio, 11°03'28"S, 42°42'37"W, 680 m, 24 June 1996 (fl.), *M.L. Guedes, A.M. Giulietti, M. Hind, S. Smith, R. Harley, E.M. Silva & H.P. Bautista* (PCD) *2992* (HUEFS, SPF); Itaberaba, Fazenda Itaberaba, Morro Itibiriba, 12°30'04"S, 40°04'59"W, 280 m, 23 Oct 2005 (fl.), *E. Melo, A.C. Queiroz, J.M. Rebouças & A.O. Moraes 4134* (HUEFS); Itatim, Morro do Letreiro, 12°43'39"S, 39°46'35"W, 197 m, 3 July 2012 (fl.), *M. Paiva 33* (HUEFS); idem, próximo a inselberg, início da cidade, 12 Sept 2018 (fl.), *G.V. Fonseca, T.T. Silva & L.C. Souza 232* (HURB19917); Milagres, Mata na base do Morro Tyresoles, 30 Aug 1996 (fl.), *M.A. Mayworm 21* (HUEFS). Sento Sé, Parque Nacional Boqueirão da Onça, Povoado Brejo da Brázida, Baixa da Caiçara, 10°20'11,7"S, 41°45'53,9"W, 7 July 2015 (fl.), *D.S. Fernandes & E.D.S. Almeida 254* (HVASF); Sobradinho, Rodovia Sobradinho-Sento Sé, Km 20, 09°32'S, 04°10'W, 24 July 1983 (fl.), *L. Coradin et al. 5986* (CEN, MO, NY, UEC); Uauá, Fazenda Experimental DNOCS, 21 Oct 1981 (fl.), *E.L.P.G. Oliveira 397* (MO2851044, MO2851763); **Pernambuco:** Cabrobó, Serra do Bendó, Eixo Norte, 08°24'55.9"S, 39°11'14.6"W, 570 m, 22 Sept 2009 (fl.), *A.P. Fontana, J.A. Siqueira-Filho, R.C. Forzza, M.M. Coelho & G.C. Rodrigues 6194* (HVASF); Petrolândia, próximo da casa da turbina, hidrelétrica, 21 Nov 1954 (fl.), *D. Andrade-Lima 1940/54* (HUEFS, IPA); Serrita, Sítio Pedra do Cachorro, 08°03'01,2"S, 39°18'27,41"W, 15 Oct 2013 (fl.), *A.C.P. Oliveira, J.R. Silva & R.S. Silva 3019* (HVASF); **Sergipe:** Porto da Folha, 7 Nov 1984 (fl.), *G. Viana 1059* (ASE).

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Anthurium reubarbarum: A new species of *Anthurium* sect. *Belolonchium* (Schott) Engl. (Araceae) for the eastern Andes of Colombia

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Abstract. We describe and illustrate *Anthurium reubarbarum* López-Flor., Edwin Trujillo & A.Hay, a new species of sect. *Belolonchium* (Schott) Engl. from the Department of Huila in Colombia. The definition of sect. *Belolonchium* is briefly commented upon. The new species is distinguished diagnostically from the similar *A. melampyi* Croat and *A. matabanchoyae* A.Hay & M.Llano, and compared with two other *Belolonchium* species occurring in geographic proximity to the new species.

Keywords: *Anthurium*, sect. *Belolonchium*, Colombia, Huila, new species.

INTRODUCTION

The Araceae family is one of the most diverse groups of monocotyledons in the neotropics. The family has a great capacity to adapt to different ecosystems, with their diverse growth habits allowing them to contribute conspicuously to the complexity of the forest as terrestrial plants, nomadic lianas, epiphytes, lithophyes, helophytes and aquatic plants.

Anthurium Schott and *Philodendron* Schott are the most diverse genera, or at least the most speciose, together constituting almost 41.3 % of the total number of named species accepted in the family worldwide. *Anthurium* currently has 1319 accepted species, although it is estimated that this number may become as high as 3000 (Boyce and Croat 2025). The genus is currently divided into over 20 sections, a number of which are non-monophyletic, and

with ongoing molecular phylogenetic analysis (Carlsen and Croat 2013 & 2019, and more recent unpublished work) the sectional limits are likely to continue to change as they become more soundly based. In short, there is still a way to go before a new, full and well-founded infrageneric classification of *Anthurium* can be arrived at, though promising progress is being made.

Section *Belolonchium*

Sect. *Belolonchium* (Schott) Engl. (Schott, 1860: 528; Engler, 1878: 63) is one of the largest in *Anthurium*, likely to exceed 300 species (Croat et al. 2015). Its 'core', and often very striking, species are characterised by usually short, thick internodes with the cataphylls persisting dead as distinctive reddish-brown fibres, long petioles, large, moderately leathery usually sagittate blades often concave at the confluence of the anterior and posterior lobes, the posterior lobes usually pronounced and pedately veined, hooded spathes and nutant to pendulous spadices (Carlsen and Croat, 2019). The section has yet to be lectotypified, but it is virtually certain that the chosen type will be from this core group (see comments in, e.g., Hay and Llano 2024). Nevertheless, even after the segregation from *Belolonchium* of the Mexican and Central American elements sect. *Andiphilum* (Schott) Croat (in part; see Croat and Hormell 2017) and sect. *Cordata-punctata* Croat & Carlsen (Croat and Carlsen 2020, '*Cordato-punctatum*'), a number of mainly Andean species hitherto (and still, pending revision) attributed to this section, while agreeing vegetatively with this description, have spreading to reflexed spathes and upright spadices. Recent studies by Carlsen and Croat (2013, 2019), though sampling only a few species, suggest these latter species will be found to be in a different clade from the 'core' species, with the implication that currently accepted sect. *Belolonchium* is still not a monophyletic group.

The last review carried out for Colombia reported 23 species for the section (Engler, 1905), however, this number has almost doubled in recent years, as a result of the initiative of various researchers (e.g. Croat and Mora, 2004; Croat et al. 2006; Croat et al. 2009, 2010; Hay and Cedeño Fonseca 2019; Hay and Llano-Almario 2024; López-Floriano et al. 2024a, 2024b), and is likely to increase substantially as Colombia is more intensively explored. Here, we present another new species of *Anthurium* sect. *Belolonchium* recorded from the eastern slope of the Andes on the border between the departments of Huila and Caquetá. The new species accords morphologically with 'core' *Belolonchium* as outlined above.

MATERIAL AND METHODS

The specimen was collected during a field trip in the Caquetá and Huila departments. The specimens were processed at the herbarium HUAZ from Universidad de la Amazonia, the specimens were deposited in HUAZ and COL. The determination is made with the help of taxonomic keys of *Anthurium*, we also reviewed articles and monographs. The terminology used in this manuscript is the one proposed by Croat and Bunting (1979) and Beentje (2010), except that the morphologically informal term 'bloom' is substituted for 'inflorescence' and 'floret' for 'flower', following Hay and Mabberley (1991) and Hay (2019) where it has been proposed that the spathe-and-spadix of Araceae, conventionally referred to as the inflorescence, is itself partially homologous to a flower. The measurements were taken of the dry material, and the measurements of the flowers were made with the stereoscopic Leica EZ4. The pictures were taken with a Nikon D7100, the plate was made in Photoshop, and the map was made in ArcGIS.

TAXONOMY

Anthurium reubarbarum López-Flor., Edwin Trujillo & A.Hay, **sp. nov.** (Figure 1).

Type: Colombia. Departamento del Huila, Municipio de Suaza, vía Florencia-Suaza, 1°45'47.13"N, 75°46'47.86"W, 2020 m., 19 May, 2023. *O. López & E. Trujillo 286* (holotype HUAZ; isotype COL).

Diagnosis

The new species is similar in aspect to *Anthurium matabanchoyae* A.Hay & M. Llano (Colombia: eastern Nariño) and *A. melampyi* Croat (Colombia: western Nariño; Ecuador: Carchi). It differs from the former by lacking the multiply flanged petioles and abaxially flanged costae, primary and secondary venation, and by having the bases of the costae and the pair of basal primary veins abaxially verruculate; it also has a distinctly narrower spathe lacking a prominent central keel on the abaxial side. It differs from *A. melampyi* by not having the petioles ribbed, by the bases of the costae and basalmost primary veins abaxially verruculate, by the venation drying distinctly dark brown abaxially (versus yellowish brown in *A. melampyi*), by the continuous marginal vein beginning level with above the base of the anterior lobe (vs from low on the posterior lobes), and by the purplish spadix (versus yellowish white or green).

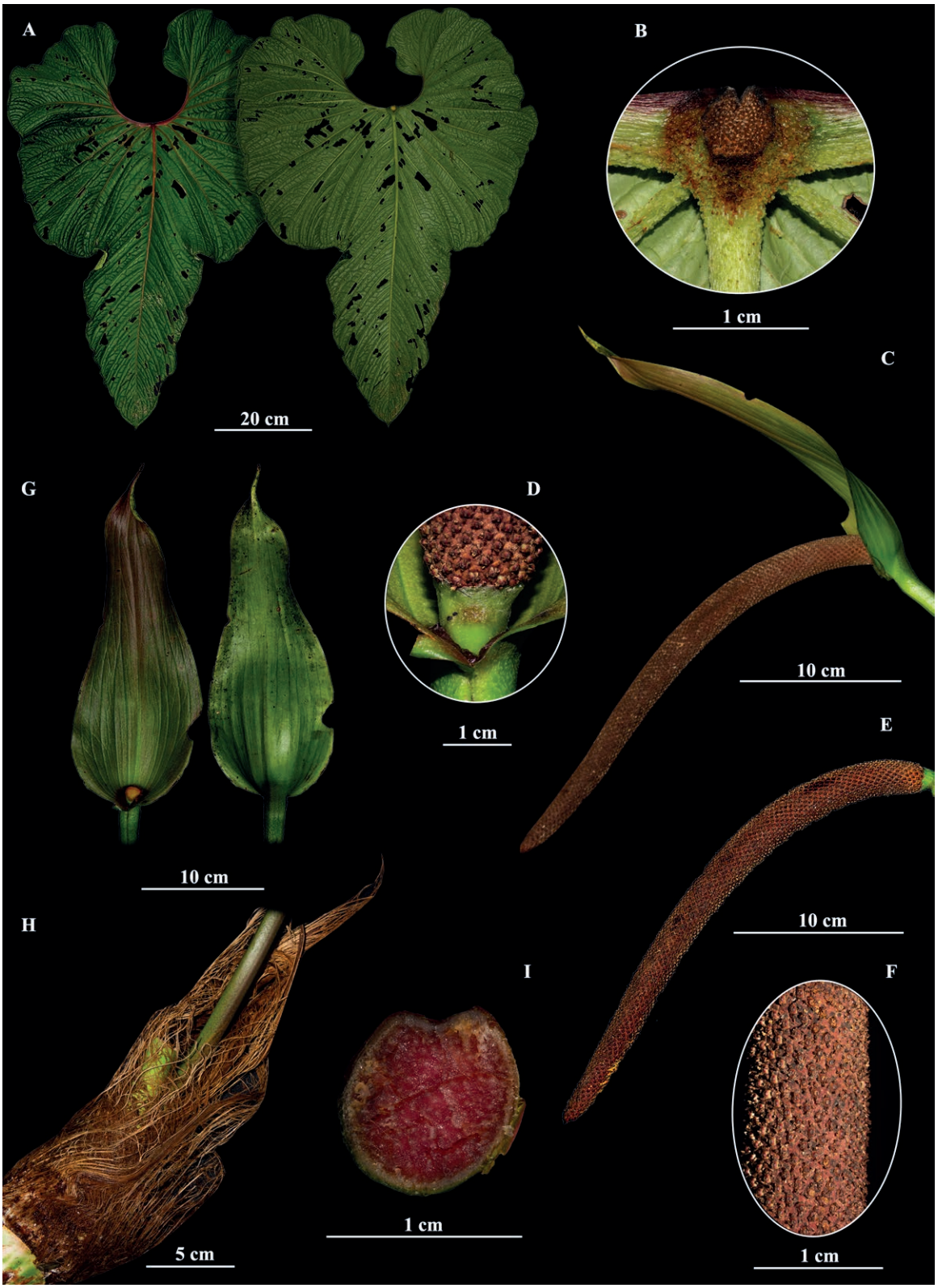

Figure 1. *Anthurium reubarbarum* López-Flor., Edwin Trujillo & A. Hay. A. Adaxial an abaxial leaf Surface. B. close-up of the leaf insertion site. C. Inflorescence. D. Stipe. E. Spadix. F. Close-up of the flowers. G. Spathe. H. Cataphylls. I. transverse cut of the petiole. From *O. López & E. Trujillo 286* (HUAZ). All photos by O. López.

Description

Terrestrial herb; stems over 1 m. high, light green; internodes 3.3 cm long, 6.7 cm diam.; cataphylls 30.7 cm long, 11 cm wide at the base, persisting as light brown fibers with fragments of the epidermis; petioles slightly or sharply sulcate 1.28–1.47 m long, 1.7–1.8 cm diam. in the thicker portion, purple above and green below externally, purplish red internally, drying dark brown, papillate at the apex and on the geniculum with the bases of the costae and basal veins papillate abaxially; geniculum 2.5 cm long, 1.6 cm diam., purple above and green below, drying darker brown than the petioles; leaf blades coriaceous, obpyriform in outline, strongly concave at the confluence of the anterior and posterior lobes to sagittate, 88.3 × 65 cm, 1.3 times longer than broad, ca. 0.7 times the length of the petiole, prominently lobed at base, margin undulate, acuminate at apex, adaxially dark green, matte, bullate, drying dark brown, abaxially pale green, semiglossy, drying reddish brown; anterior lobe 65.2 × 65 cm, straight to concave above middle; posterior lobe 23.8 × 23 cm, rounded; sinus hippocrepiform to spathulate, 23.5×16.7 cm; posterior costae curved, naked for 22 cm, each emitting ca. 11 primary ['basal'] veins on the acroscopic side in a diminishing pedate series, each abruptly turning up near the margin and forming a submarginal vein running along and then to the margin and replaced by the next, the submarginal vein only becoming continuous level with above the base of the anterior lobe (see below); anterior costa convex, slightly elevated, very marked in 70 % of the anterior lobe, then fading towards the apex in the surface adaxial, rounded, prominent and slightly ribbed along its entire length abaxially; primary lateral veins 18 pairs, arising at angle 40–58°, slightly raised and reddish above, prominent and ribbed, light green bellow, drying dark brown at both surfaces; interprimary veins present, prominent, drying dark brown, sinuous and formed by the confluence of secondary veins; secondary veins numerous, prominent below, drying dark brown; tertiary veins sunken above, slightly raised bellow; submarginal collective veins arising from 3rd and 4th pairs of basal veins, 0.4–1.4 cm from margin; basal veins 12 pairs, 1st free to base, 2nd fused to 2.3 cm, 3rd fused to 3.3 cm, 4th fused to 5.3 cm, 5th fused to 7.8 cm, 6th fused to 9.5 cm, 7th fused to 10.8 cm, 8th fused to 12 cm, 9th ,10th , 11th fused to 13.1 cm. Bloom solitary; peduncle erect, terete to slightly and sharply sulcate, 68.7 cm long, 11.6 mm diam., green; spathe lanceolate, 28 × 7 cm, forming an angle with the peduncle of 180° and overarching the spadix, light green with purple shades towards the apex, glossy on both surfaces, obtuse at the base; spadix stipitate, 25–30 cm long, 2.1 cm diam., tapered, reddish brown, drying dark brown, stipe, 8 mm long, 12.8 mm diam., light green; florets 14–15 in the principal spiral, 10–12 in the secondary spiral, 2.0 × 2.0 mm; pistil 3.2 mm long; stigma ellipsoid 2.5×1.0 mm; stamens 4 mm long, exserted above petals; filaments 4 mm, flattened; anthers 0.8 mm. Infructescence not observed.

Etymology

The specific epithet is the Latin for the edible rhubarb (*Rheum rhabarbarum* L. or *R.´ hybridum* Murr., Polygonaceae), as a noun in apposition, alluding to the purplish pigmentation of the petioles.

Distribution and habitat

Anthurium reubarbarum is endemic to Colombia, only known from the eastern slope of the Andes Mountains in Huila at 2020 m (Fig. 2). It occurs in the *mountain wet forest* life zone (Holdridge et al. 1971).

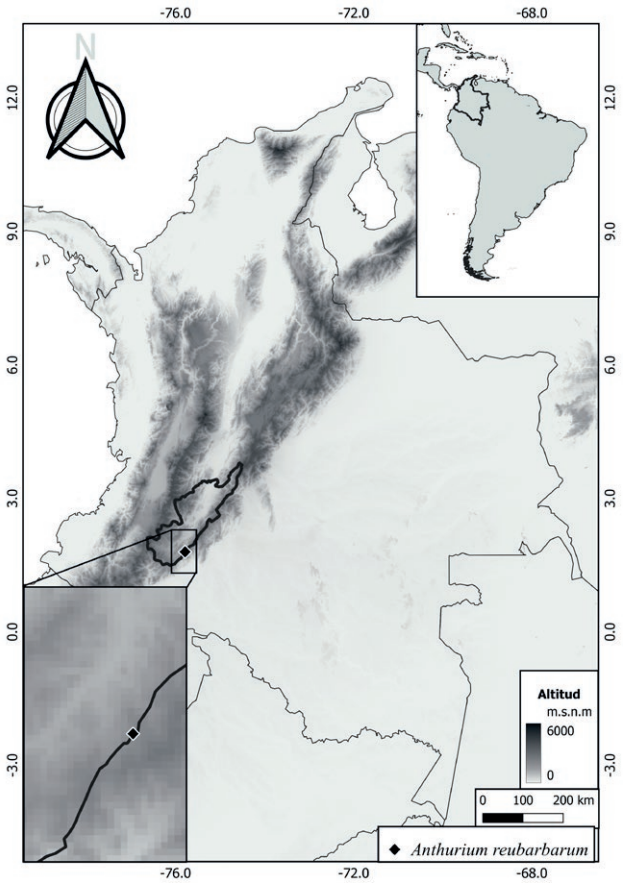

Figure 2. Localization of *Anthurium reubarbarum* López-Flor., Edwin Trujillo & A. Hay.

Note

Besides with the species compared in the above diagnosis, *Anthurium reubarbarum* can be confused with two more local *Belolonchium* species recently recorded for the eastern slope of the Andes Mountains: *A. caquetense* López-Flor., Edwin Trujillo & Croat (López-Floriano et al. 2024b), from which the new species differs by having internodes 3.3 cm long (vs 0.8–1.6 cm), petioles slightly or sharply sulcate, 1.28–1.47 m long. (vs narrowly and obtusely sulcate or narrowly and acutely sulcate, 81–95 cm long.), papillate at the apex and on the geniculum (vs not papillate), leaves obpyriform to sagittate (vs broadly ovate to broadly triangular-ovate), basal veins 12 pairs (vs 7–9), spadix reddish brown (vs dark purple). It can also be confused with *A. florenciense* Croat, López-Flor. & Edwin Trujillo (López-Floriano et al. 2024b), from which the new species differs by internodes 3.3 cm long (vs 0.5–0.6 cm), petioles papillate at the apex and on the geniculum (vs not papillate), leaves obpyriform to sagittate (vs narrowly ovate-triangular), primary lateral veins 18 pairs, ribbed (vs 13–15, not ribbed), basal veins 12 pairs (vs 8–9); spadix reddish brown, (vs yellowish green).

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A new species of *Schlegelia* (Schlegeliaceae) from the Colombian Amazon forest

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Abstract. *Schlegelia nelcyiae*, from the remnants of wet Amazonian forests in Colombia is described, illustrated, and compared with its similar species. This new species is a hemiepiphytic liana, that shares several morphological features with *S. brachyantha*. However, it can be differentiated from this species in the shape of the leaves, inflorescence type, calyx, and corolla shape, size, and color. An updated key to the species of *Schlegelia* is presented. The present contribution increases to 25 the number of *Schlegelia* species, 18 of them known from Colombia, the country with the highest diversity of the genus.

Keywords: *Schlegelia nelcyiae,* northwestern Amazon, Schlegeliaceae.

INTRODUCTION

The family Schlegeliaceae Reveal (1995: 74–75) is a small family of Lamiales, described three decades ago (Reveal 1995). It is restricted to the Neotropics, and it occurs from Mexico to Brazil (Gentry 2009; Aymard-Corredor and Jaramillo 2023). Before Schlegeliaceae was considered a formal family by Reveal (1995), A. H. Gentry had proposed the tribe *Schlegelieae* Gentry of the Bignoniaceae Juss. (1789: 137) (Gentry 1980). For this reason, the family is still included inside the Bignoniaceae in many herbaria. The tribe was suggested as it was difficult to position these genera within Bignoniaceae or Scrophulariaceae (Gentry 1980; Armstrong 1985). The family includes four genera, two of them monotypic: *Exarata* Gentry (1992: 503–507) (*E. chocoensis* A.H.Gentry), from the Chocó Region, *Synapsis* Griseb. (1866:187) (*S. ilicifolia* Griseb.) from Cuba; and two relatively larger genera: *Gibsoniothamnus* L.O.Williams

(1970:213) (ca. 10 species) distributed in Mesoamerica and the Caribbean, and *Schlegelia* Miq. (1844:785). Phylogenetic analyses confirmed that Schlegeliaceae is distinct from Bignoniaceae and Scrophulariaceae (Spangler and Olmstead 1999, Olmstead et al. 2009). Recent phylogenetic reconstruction based on chloroplast and nuclear genes places Schlegeliaceae (a) sister to Martyniaceae Horan. (1847:130) and Thomandersiaceae Sreem. (1977: 413–416) (Liu et al. 2020); (b) sister to a clade including Pedaliaceae R. Br. (1810:519), Lentibulariaceae Rich. (1808:23), Acanthaceae Juss. (1789: 102-103), Bignoniaceae and Verbenaceae J. St.-Hil. (1805:245) (BS=98, 80 cp genes, (Fonseca 2021); (c) sister to Bignoniaceae and Verbenaceae (BS=65, 410 nuclear genes, Fonseca 2021), or (d) sister to a clade including Verbenaceae, Martyniaceae and Bignoniaceae (BI=1.0, Zuntini et al. 2024). The relationships of the family are still not clear; a better sampling of Schlegeliaceae ought to shed some light on the relationships of the family and the order Lamiales.

Schlegelia comprises 25 species (including the new species described herein), as presently circumscribed in the key (Aymard Corredor and Jaramillo 2023) improved here. The genus occurs in the states of Chiapas, Oaxaca, and Veracruz in Mexico (i.e., *S. nicaraguensis* Standl.; *sensu* Villaseñor Ríos 2016), the Caribbean (i.e., *S. parasitica* [Sw.] Miers ex Griseb.), Mesoamerica, the Pacific Coast- Chocó Region, the Guayana Shield to the Amazonia of Brazil, Colombia, Ecuador, Peru and Venezuela; at elevations from sea level to 2100 m (Gentry 1973, 1977, 1982a, 1982b, 1997, 2001, 2009). It is recognized by its conspicuous hemiepiphytic habit, which consists of lianas climbing by adventitious roots, without tendrils (Gentry 1973, 1980). The leaves are simple, with small pseudostipules. The inflorescences are axillary racemes or terminal panicles; the calyx is cupular or irregularly lobed, the corolla is tubular, tubular-campanulate, infundibuliform-campanulate or hypocrateriform-campanulate, white, pink, red, yellow or purple, with an incompletely bilocular placenta**,** the fruit is a globose berry, up to 5 cm diameter, and it has a persistent calyx (Gentry 1980, 2009).

No complete monograph of *Schlegelia* has been completed, although the genus has been treated mainly as part of Bignoniaceae for Flora of Panama (Gentry 1973), Flora of Ecuador (Gentry 1977), Flora of Venezuela (Gentry 1982a), Flora of Veracruz (Gentry 1982b), Flora of the Venezuelan Guayana (Gentry 1997), Flora of Costa Rica (Burger and Barringer 2000), Flora de Nicaragua (Gentry 2001), Flora of Colombia (Gentry 2009) and Manual de Plantas de Costa Rica (Morales 2015). In addition, in the checklists: Checklist of the plants of the Guiana Shield (Funk et al. 2007), "Catálogo de las plantas vasculares nativas de México" (Villaseñor Ríos 2016), and "Catálogo de plantas y líquenes de Colombia" (Gradstein 2016).

The present work describes and illustrates a new species of *Schlegelia*, found in isolated populations in a highly fragmented wet Amazon forests near urban areas. Currently, the distribution of this new species is restricted to the Valparaiso and Solano municipalities, Caquetá department. However, a more detailed exploration is required in other forest remnants of neighboring municipalities where additional populations of this species may occur. The present contribution increases to 25 the number of *Schlegelia* species, 18 of them known from Colombia, the country with the highest diversity of the genus.

MATERIALS AND METHODS

This work is based on morphological and herbarium studies. The species description was established on field observations (flower material was preserved in ethanol) and herbarium specimens. The taxonomic literature on *Schlegelia* was consulted, mainly the species key contained in Aymard Corredor & Jaramillo (2023). In addition, the Bignoniaceae for Flora of Venezuela (Gentry 1982a), Flora of Venezuelan Guayana (Gentry 1997), Flora of Colombia (Gentry 2009), and the *Catálogo de Plantas y Líquenes de Colombia* (Gradstein 2016) was also reviewed. We examined the online botany collections of the Smithsonian National Museum of Natural History (https://naturalhistory.si.edu/research/botany), and Tropicos (http://legacy.tropicos.org/Home.aspx) to update the current nomenclature and geographical information. Terminology for vegetative characters, inflorescences, flowers, and fruit morphology follows Gentry (Gentry 1977, 2009) and Font-Quer (Font-Quer 2001).

TAXONOMIC TREATMENT

Schlegelia nelcyiae M.A.Jaram., Edwin Trujillo & Aymard, **sp. nov.** (Figure 1).

Type: COLOMBIA. Caquetá, municipio de Valparaíso, vereda La Rico arriba, sobre la carretera hacia Valparaíso, 1 km antes del puente sobre el río pescado, 1° 11´ 56" N; 75° 40' 32" W, 217 m, 23 diciembre 2023 [fl]. *E. Trujillo 8399* (holotype COAH; isotypes COL, JBB, LAMUA). (Figs. 1, 2).

Diagnosis

Schlegelia nelcyiae resembles *S. brachyantha* but can be differentiated from this species by having evident

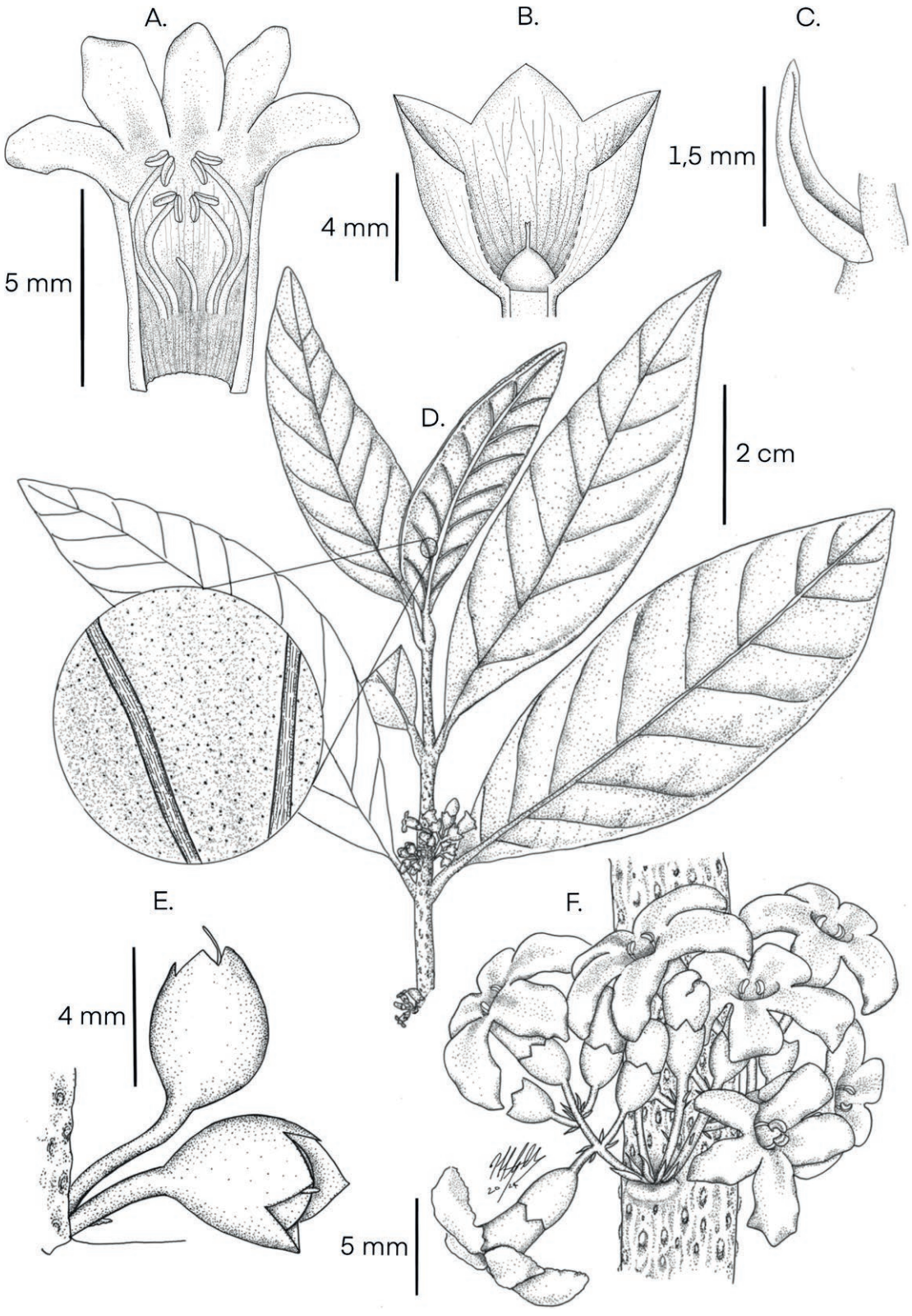

Figure 1. *Schlegelia nelcyiae* A. Open corolla showing didymanous stamens and staminode. B. Calyx open showing pistil. C. Bract at the base of inflorescence. D. Habit with detail of lower leaf surface, E. Young fruits. F. Inflorescence. Illustration by Manuela A. Sánchez Quiroga on *E. Trujillo 8399* (COAH).

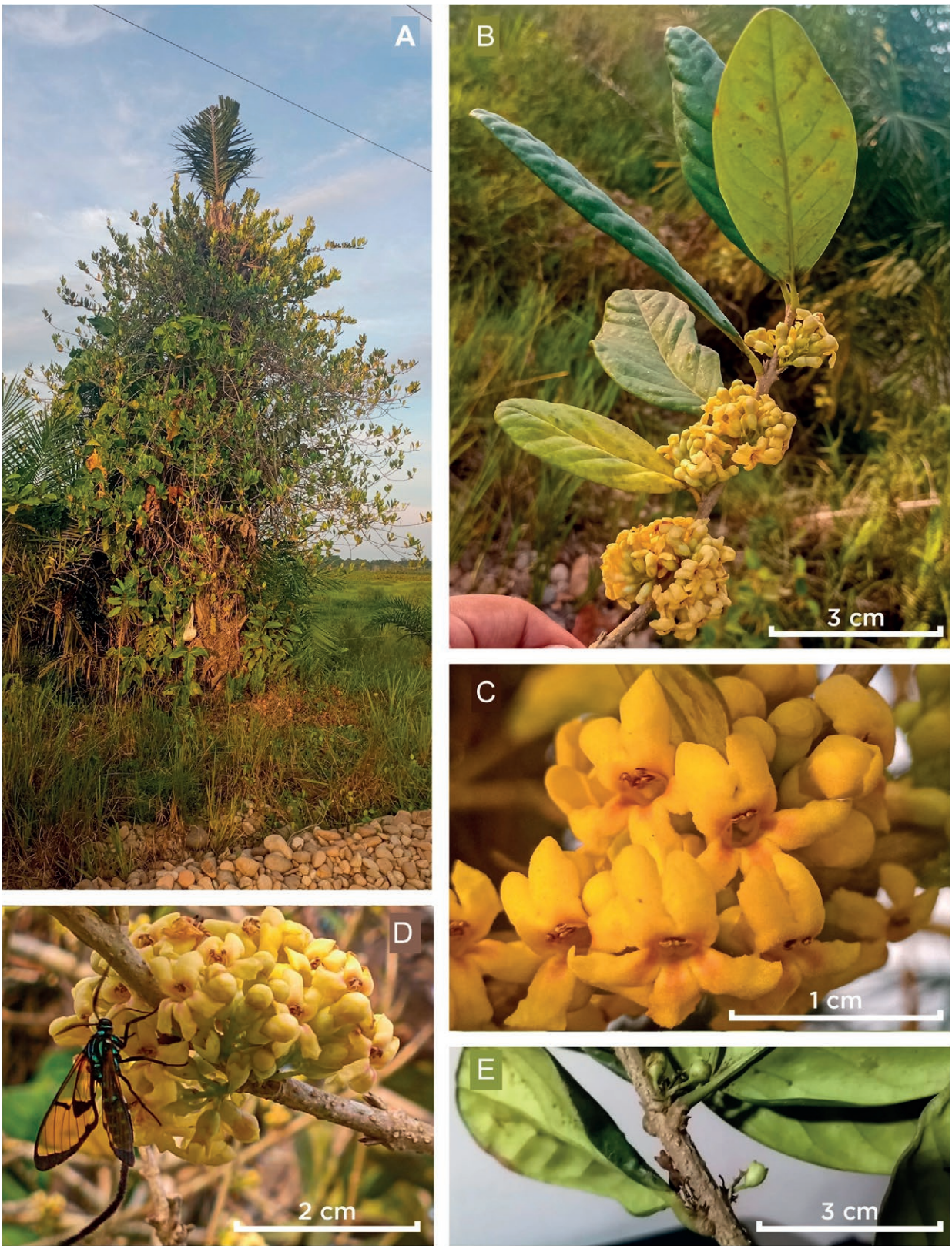

Figure 2. *Schlegelia nelcyiae*. A. Habit. B. Flowering branch. C. Detail of flowers. D. Flowers with floral visitor (Erebidae: *Trichura cerberus* (Pall., 1772). E. Fruits. Photos by Edwin Trujillo Trujillo.

pseudostipules (vs. pseudostipules not evident), leaves elliptic or elliptic-obovate (vs. ovate or ovate-oblong), inflorescence racemose (vs. fasciculate), calyx 3–4 × ca. 2 mm with acute lobes, without disk-shaped glands (vs. 3.5 × 3.5 mm, truncate, with disk-shaped glands outside), corolla 9–10 mm long, ca. 3 mm wide in the mouth, lobes ca. 5 mm, creamy turning light yellow (vs. 13–19 mm long, 5–7 mm wide in the mouth, lobes 2–3 mm long, white), nectariferous disk absent (vs. present), pistil 2 mm long (vs. 5 mm long), fruits 2.4–2.8 mm in diameter (vs. 8–10 mm).

Description

Hemiepiphytic liana, internodes 2–7 cm long, pale brown when dry, branches sparsely lenticellate. Pseudostipules lanceolate, glabrous, 5–6 mm long. Leaves simple, petioles 7–12 mm long, canaliculate, leaf blade elliptic or elliptic-obovate, 7–10 × 3–4.5 cm; coriaceous, glabrous on both surfaces, with white disk shape dots on the bellow surface (Fig. 1D), leaf base obtuse, apex acute, margin entire, pale-brown when dry. The venation is brochidodromous, with midrib prominent on the abaxial surface, 9–10 pairs of secondary veins, and the tertiary veins inconspicuous on both surfaces. Inflorescence axillary, racemose (rachis 7–12 mm in flower, 4.8–5.0 mm in fruit), rachis sparsely adpressed pubescent, subtended by 2 bracts ca. 1.5 mm long, lanceolate, glabrous on both sides, 5–8-flowered; pedicels 1–3 mm long, 1–flowered along the rachis, each flower subtended by 2 lanceolate bracteoles ca. 1 mm long (Fig. 1F). Calyx cupular**,** bilabiate, 3–4 × ca. 2 mm, 4-lobed, triangular lobes, ca. 1 mm long, apex acute, light green turning cream when live, brown when dried, glabrous, reticulate on both surfaces**.** Corolla 9–10 mm long, ca. 3 mm wide in the mouth, tube 5–7 mm long, lobes ca. 5 × 4–5 mm, campanulate with lightly reflexed lobes, puberulent, cream turning light yellow, light pink longitudinal lines around the throat; glabrous; stamens didynamous (Fig. 1A), subexserted**,** filament ca. 5 mm long**,** glabrous, inserted ca. 1 mm from base of corolla, staminode absent or present; anthers ca. 0.5 mm long, oblong, glabrous. Pistil with ca. 1 mm long, glabrous style, and conical ovary, ca. 1 × ca. 1 mm, glabrous, nectariferous disk absent. Fruit a berry, peduncle 4.8–5.4 mm long, 2.4–2.8 mm in diameter, spherical, light green, glabrous, completely covered persistent calyx in an immature state and peduncle ca. 8 mm long, ca. 7 mm in diameter, spherical, yellow, glabrous in mature state (Fig. 1E, 2B). Seeds not seen.

Etymology

Schlegelia nelcyiae is named after Mrs. Nelcy Trujillo Collazos, the mother of the second author. Mrs. N. Trujillo endured the armed conflict in the Caquetá department for many years, becoming the bastion of her family.

Distribution and habitat

The species occurs in wet forest remnants at elevations of 200 m. At the type locality, *S. nelcyiae* grows on oil palms (*Elaeis guineensis* Jacq.; Fig. 2A). Although introduced, this species has become naturalized in the region, likely due to dispersal by birds from populations in Valparaíso's urban area. These communities are found along the edges of the main road leading to Valparaíso, a region characterized by fertile plains and seasonal flooding following heavy rainfall.

Phenology

This new species was collected with flowers in December and observed with fruits in April and December.

Conservation status

This new taxon is currently known only from two collections mentioned here; therefore, it is reported here as a rare species. However, under IUCN guidelines (IUCN Standards and Petitions Committee 2022), two localities constitute a status of data deficient (DD) to determine its conservation status, especially the Area of Occupancy (AOO) and Extent of Occurrence (EOO). However, the conservation of these wet forests in this part of the Caquetá (upper basin) river in Colombia is in risk of deforestation and degradation in the last four decades (Murad and Pearse 2018).

The greatest deforestation rates have been observed since 1986 on the Amazonian foothills and central regions of Caquetá, Meta and Putumayo department, but also in the municipality of San José del Guaviare (Ruiz et al. 2011). According to RAISG report (2022), the deforestation in the Amazon Colombia region between 2001-2020 was 23.004 km^2. The area where *S. nelcyiae* occurs is not protected by any regional initiatives to conserve these very fragmented forests.

Notes

The species described here, is morphologically similar to *S. brachyantha* by its axillary inflorescence, corolla infundibuliform-campanulate or campanulate, and small fruit 0.5–2.5 cm in diameter. By its short inflorescence, *S. nelcyiae* also shows a certain resemblance with *S. parviflora*. However, this new species differs from these two taxa and the other species in the characters presented in diagnosis, and in the key to the species presented below.

Others collections

COLOMBIA. **Caquetá**. Municipio de Solano, vereda Orotuya. 00° 19´22,1" N; 74° 48' 58,5" W, 230 m, 9 diciembre 2017 [fr]. *M. Montoya, K. Vargas, J. Aldana, J. Alvarado, F. Quintero, A. Angueyra & E. Paky 4650* (COAH).

Key to the species of *Schlegelia*

Modified from Aymard Corredor and Jaramillo (2023), species indicated with an asterisk (*) are endemic to Colombia.

1. Inflorescences cauliflorous or ramiflorous 2
1. Inflorescences terminal o axillary 10
2. Corolla tubular-campanulate, > 3.5 cm long, ca. 1.1 cm wide to the mouth of the tube, purple or magenta, rarely white; lobes > 5 mm long; fruit ca. 4 cm diam. 3
2. Corolla tubular to narrowly tubular, 0.8–2.5 cm long, 0.2–0-4 cm wide to the mouth of the tube, white with apex pink, yellow, red or orange; lobes 1–4 mm long; fruit 1–1.5 cm diam. 4
3. Leaves strongly coriaceous, bullate, longer than 30 cm long; inflorescences a multifloral raceme, densely contracted, subtended by a conspicuous fascicle subtended by basal bracts..... ***S. dresslerii*** (Panamá, Colombia, Ecuador)
3. Leaves subcoriaceous or coriaceous, not bullate, 7–11 cm long; inflorescences a paucifloral raceme; not subtended by basal bracts ..... ***S. nicaraguensis*** (México, Mesoamérica, Colombia)
4. Pseudostipules present; corolla tube white (the lobes apex and calyx pink), pink or yellow; inflorescences a crowded (densely branched), a slightly contracted panicle or a subracemose..... 4
4. Pseudostipules inconspicuous or absent; corolla (tube and lobes) red, red-orange or red-purple, calyx red or brown; inflorescences a paucifloral racemes 8
5. Pseudostipules subulate 6
5. Pseudostipules lanceolate 7
6. Inflorescences a crowded densely branched panicle; corolla tube yellow; ovary lepidote ..... ***S. sulphurea*** (Panamá, Colombia, Ecuador)
6. Inflorescences a slightly contracted panicle; corolla tube white (the lobes apex and calyx pink) or pink; ovary glabrous ..... ***S. macrophylla*** (Brazil, Colombia, Perú)
7. Inflorescences a crowded panicle, densely branched; corolla tube white (the lobes apex and calyx pink), 2–2.5 cm long ..... ***S. fastigiata*** (Guatemala, Costa Rica, Panamá, Colombia, Ecuador)
7. Inflorescences subracemose; corolla tube pink, ca. 0.8 cm long ..... ***S. roseiflora*** (Brazil, French Guiana, Perú)
8. Leaves densely hirsute in the midvein and main veins on the lower surface; main veins impressed on the upper surface ..... ***S. hirsuta**** (Colombia)
8. Leaves glabrous or lepidote on the lower surface, main veins flat on the upper surface 9
9. Leaves chartaceous to subcoriaceous, elliptic to wide-elliptic, two times as long as wide, 15–26 cm long, the base auriculate, lobes rolled up; corolla tube 2–2.5 cm long, red-purple; calyx 5–7 mm long; inflorescences a simple raceme ..... ***S. spruceana*** (Brazil, Colombia, Guyana, Venezuela)
9. Leaves coriaceous, narrowly elliptic, more than two times larger than wide, 9–16 cm long, the base rounded or cuneate; corolla tube 1.8–2 cm long, red; calyx 3–5(–6) mm long; inflorescences glomerulate, with several racemes ..... ***S. cauliflora*** (Brazil, Colombia, Perú)
10. Inflorescences terminal, 14–40 cm long. 11
10. Inflorescences axillary, 0.5–21 cm long 13
11. Inflorescences with foliaceous bracts along the rachis, 1–2.5 ×1–2 cm; a biogeographical Choco species ..... ***S. darienensis*** (Colombia, Ecuador, very probably Panamá)
11. Inflorescences with obsolete bracts along the rachis, 1–2 × ca. 1 mm; Amazonian and Guayana Shield species 12
12. Calyx subtruncate, 4–5 mm long; corolla tube ca. 2 mm wide; fruit 1–1.6 cm diam., 1/3 to 1/4 covered by a persistent, subtruncate calyx ..... ***S. scandens*** (Brazil, Colombia, Perú, Suriname, Venezuela)
12. Calyx irregularly 2–3-labiate, 5–9 mm long; corolla tube ca. 3 mm wide; fruit ca. 1 cm diam. The lower 2/3 covered by a persistent, distinctly toothed calyx ..... ***S. violacea*** (Brazil, Guianas, Venezuela)
13. Fruits 3.5–5 cm in diam. 14
13. Fruit 0.5–2.5 cm in diam. 15
14. Leaves broadly obovate or rarely elliptic, coriaceous, apex rounded, base acute and decurrent on petiole, not lepidote; inflorescences 2.5–3.5 cm long, hispidulous; fruits 4.5–5 cm diam ..... ***S. macrocarpa*** (Guatemala)
14. Leaves elliptic-obovate, chartaceous or subcoriaceous, apex apiculate, base broadly cuneate; sparsely lepidote on both sides; inflorescences 1–1.2 cm long, puberulent; fruits 3.5–4 cm diam. .. ***S. nicaraguensis*** (México, Mesoamérica, Colombia)

15. Leaves panduriform (fiddle shape), the base strongly auriculate ..... .***S. pandurata*** (Colombia, Ecuador)

15. Leaves elliptic, obovate, elliptic-obovate, wide-ovate, lanceolate, oblanceolate, oblong-ovate or oblong-elliptic, the base cuneate, rounded or abrupt subcordate, slightly or not auriculate 16

16. Corolla golden yellow, lobes 1–2 mm long; calyx toothed, lobes 2–2.5 mm ..... ***S. aurea*** (Brazil)

16. Corolla white with pink tip, lilac, creamy, light-yellow, or purple, lobes 3–6 mm long; calyx truncate, subtruncate or slightly toothed, lobes 0.5–1 mm long 17

17. Inflorescences a crowded, woody contracted panicle, densely branched, the branchlets short and conspicuously jointed ..... ***S. sulphurea*** (Panamá, Colombia, Ecuador)

17. Inflorescences not-woody panicles, racemes or axillary fascicles-1-several flowers 18

18. Inflorescences fasciculate or very short racemose; corolla infundibuliform-campanulate or campanulate, 3–6 mm wide toward the mouth 19

18. Inflorescences contracted or elongate panicle, racemose-to narrowly paniculate, more or less fasciculate (*S. parviflora*) or an open raceme; corolla campanulate-hypocrateriform or tubular, 4–5 mm wide toward the mount 24

19. Leaves widely-obovate or widely elliptic; corolla tube 0.6–0.8 cm long ..... ***S. axillaris*** (Antilles)

19. Leaves elliptic, elliptic-oblong, elliptic-obovate, ovate, ovate-oblong or obovate; inflorescences fasciculate or a very shortly raceme; corolla tube 1–3.5 cm long 20

20. Leaves 4–10 cm long, elliptic, elliptic-obovate, ovate or ovate-oblong; corolla 1.0–1.9 cm long 21

20. Leaves 7.5–20 cm long, elliptic, oblong or elliptic-oblong; corolla 2.5–3.5 cm long 22

21. Leaves 4–7 cm long, ovate or ovate-oblong; inflorescence fasciculate; corolla 1,3–1.9 cm long, infundibuliform-campanulate ..***S. brachyantha*** (Antilles, Colombia, Costa Rica, Panamá, Venezuela)

21. Leaves 7–10 cm long, elliptic, elliptic-obovate; inflorescence racemose; corolla 1.0–1.1 cm long, corolla infundibuliform-campanulate or campanulate .....***S. nelcyiae**** (Colombia)

22. Leaves coriaceous; calyx tubulose-campanulate, ca. 1 cm long, green; corolla ca. 3.5 cm long ....***S. paraensis*** (Brazil, Guianas, Venezuela)

22. Leaves chartaceous; calyx campanulate, 0.4–0.5 cm long, violet; corolla 2.5–3 cm long ..... ***S. parasitica*** (Antilles)

23. Young branches with conspicuous and dense raised lenticels; base of leaves abrupt truncate or subcordate; petioles stout, 0.5–1.3 cm long; corolla 1.2–1.3 cm long, white, the throat yellow ..... ***S. chocoensis*** (Colombia, Ecuador, very probably Panamá)

23. Young branches with inconspicuous to sparsely lenticels; base of leaves rounded, cuneate or more or less cuneate; petioles slight, 1–2.5 cm long; corolla not longer than 1.2 cm, white or lilac or lavender, the throat lilac or lavender.. 24

24. Leaves 13–30 cm long; inflorescences a contracted panicle, the main axis little developed, 1–(4)–5 cm long 25

24. Leaves 4–22 cm long; inflorescences racemose-paniculate or an open raceme, the main axis well developed, (4)–18 cm long 26

25. Inflorescences a slightly contracted panicle; peduncle and pedicel stout and woody ....***S. macrophylla*** (Brazil, Colombia, Perú)

25. Inflorescences a contracted panicle, almost often fasciculate; peduncle and pedicel slight and herbaceous ....***S. parviflora*** (México, Mesoamérica, Brazil, Colombia, Ecuador, French Guiana, Perú, Venezuela)

26. Leaves widely-elliptic to elliptic or oblanceolate, brown when dry; inflorescences 1–(4)–5 cm long, racemose or narrowly subpaniculate, calyx black when dried ....***S. fuscata*** (Nicaragua, Costa Rica, Panamá, Colombia, Ecuador, French Guiana, Venezuela)

26. Leaves lanceolate, lanceolate-elliptic, elliptic, rarely narrowly ovate or oblanceolate, black-brown or yellowish when dry; inflorescences 4–18 cm long, racemose-paniculate to narrowly paniculate; calyx brown to yellowish when dried 27

27. Leaves lanceolate, lanceolate-elliptic, coriaceous, glabrescent or with simple trichomes and without shape-plates glands on the lower surface, black-brown when dry; inflorescences raquis puberulent to sparsely pilose; bracts 2–5 mm long, oblong, ciliate along the margins, calyx sparsely puberulent outside, brown when dry; staminode absent ....***S. longirachis*** (Colombia)

27. Leaves elliptic, oblanceolate, rarely narrowly ovate, rigid-coriaceous, with lepidote trichomes and shape-plates glands located near base of midrib on the lower surface, yellowish when dry; inflorescences rachis densely hirsute-puberulent, bracts 1–2 mm long, triangular, , short-puberulous along the margins, calyx lepidote or subpuberulous at least at the base, yellowish when dry; staminode present .....***S. monachinoi*** (Colombia, Ecuador, Venezuela)

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One name, many faces: the dolphin case of *Homalomena siaisensis* in ornamental trade

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Abstract. *Homalomena siaisensis* is a newly described species of Sumatran aroid. The species was discovered in January 2024 from South Tapanuli, North Sumatra, Indonesia. This small lithophytic species has recently gained attention in the ornamental plant trade, where it is informally known as *Homalomena* 'Dolphin Skin' and frequently marketed via social media platforms. The species is formally described and illustrated in the present work.

Keywords: Araceae, Malesia, ornamental, Philodendreae, Sumatra.

INTRODUCTION

The genus *Homalomena* in Sumatra represents a taxonomically rich group, offering considerable potential for further systematic investigation and species delimitation. To date thirty-eight species have been recorded from the Sumatran region, underscoring the island's floristic diversity and the need for continued botanical exploration (POWO 2025; Irsyam et al. 2025a; Irsyam et al. 2025b). In 2025, a previously undescribed species that had been circulating in horticultural trade under the provisional name *Homalomena* 'Dolphin' was formally described as *Homalomena pistioides* A.S.D.Irsyam, M.R.Hariri & Raynalta (Irsyam et al. 2025a).

During recent investigations, we identified a previously undocumented lithophytic species of *Homalomena*, informally referred to as *Homalomena* 'Dolphin Skin'. The type specimen was collected by the second author in January 2024 from South Tapanuli, North Sumatra. Interestingly, by December 2024, morphologically similar material had already appeared in horticultural circulation via various social media platforms. Based on comprehensive morphological assessment, we assign this distinctive, small lithophytic taxon to the Chamaecladon SG and herein describe it as *Homalomena siaisensis* A.S.D.Irsyam, M.R.Hariri & Raynalta, a species new to science.

MATERIALS AND METHODS

Field exploration was carried out in Siais Subdistrict, South Tapanuli Regency, North Sumatra, in January 2024. The plants were examined for morphological characteristics, and inflorescences were documented using a Dinolite digital microscope at the National Research and Innovation Agency (BRIN), Cibinong. Additionally, further examination of specimens was performed at Herbarium Bogoriense (BO) to identify any matching specimens.

TAXONOMIC TREATMENT

Homalomena siaisensis A.S.D.Irsyam, M.R.Hariri & Raynalta, **sp. nov.** (Figure 1)

Type**:** Indonesia, Sumatra, North Sumatra Province, South Tapanuli Regency, waterfall near the Siais Lake, 5 Jan 2024, *E Raynalta s.n.* (holotype FIPIA; isotype UIDEP).

Diagnosis

Homalomena siaisensis most closely resembles *Homalomena pistioides* A.S.D.Irsyam, M.R.Hariri & Raynalta but can be easily distinguished by having obovate to oblong elliptic leaf shape (vs obovate), cuneate to cordate leaf base (vs obtuse to cuneate), crisped leaf margin (vs entire), acuminate to mucronate leaf apex (vs truncate, rounded or mucronate), fleshy leaf texture (vs papery), lateral primary veins 4–6 (vs 2–3), brownish-green to dark red spathe (vs yellowish with reddish at base), very short stipe (vs absent), pistils in 3 whorls (vs 2 whorls), light coral pistils with tiny red spots (vs white), angular pistils (vs globose), angular staminodes with light coral colored (vs ovoid with white colored), 2–3 stamens per staminate flower (vs 2), and light red staminate florets (vs yellowish).

Description

Lithophytic small herbs, 2.9–5.4 cm in height. Stem condensed, ca 10 mm long; internodes obscured by overlapping leaf bases. Leaves 8–9 per crown; sheath fully adnate to petiole, ¼ to ½ petiole length, 1–15 mm long, reddish brown to green, with undulate hyaline margin, apex truncate to obtuse; petiole short, 4.4–24.2 mm long, 0.8–2.2 mm in diam., ribbed, canaliculate, reddish brown to green; blade obovate to oblong elliptic or asymmetrical elliptic, 0.8–7.3 × 0.5–4.2 cm, base cuneate to cordate, margin revolute with crispulate hyaline (< 1 mm), apex acuminate to mucronate, adaxial surface yellowish green to green, abaxial surface pale green, fleshy, midrib impressed adaxially, prominently raised abaxially, red; primary lateral veins 4–6 on each side, impressed adaxially, prominently raised abaxially, green; secondary veins arising from midrib; tertiary veins inconspicuous. Inflorescence erect-spreading, 2–3 together; peduncle slender, 10–25 mm long, thin, red. Spathe conical, without constriction, up to 10 mm long, up to 5 mm in diam., apex with a terminal mucro to 0.4 mm long, green, turning brownish green to dark red. Spadix ca 8.9 mm long, fertile to tip, extended after anthesis, with very short stipe; pistillate flower zone shorter than staminate flower zone, ca 2.15 mm long; pistils few, in three whorls, angular, ca 0.85 mm in height, ca 0.77 mm in diam., light coral with red spots; stigma sessile, ca 0.38 mm in diam.; staminode 1, angular, sessile, ca 0.29 mm in height, light coral with tiny red spots; suprapistillar interstice absent; staminate flower zone ca 6.8 mm long, conical, apex blunt; staminate flowers densely arranged, 1–1.25 mm long, each consisting of 2–3 stamens, light red; thecae ellipsoid, opening by a wide terminal pore; pollen powdery, white. Fruiting spathe, fruits and seeds not observed.

Etymology

The specific epithet *siaisensis* is derived from the type locality, Siais, North Sumatra. This nomenclatural choice serves to both reflect the geographical origin of the species and highlight the botanical significance of the region, which continues to yield novel taxa of remarkable diversity and endemism.

Distribution and Ecology

The species is distributed in Siais, located in the South Tapanuli region of North Sumatra. displays a lithophytic growth habit, thriving on the moss-covered cliffs near the waterfall. This species is not found in the area that is exposed to direct water splashing (Fig. 2). In the observed habitat, *H. siaisensis* coexists with *H. anthurioides* S.Y.Wong, P.C.Boyce & A.Hay.

Proposed conservation assessment

Homalomena siaisensis is known from a single location, where at least ten mature individuals have been observed. Based on the IUCN Red List categories and criteria (IUCN Standards and Petitions Subcommittee 2022), this species is provisionally assessed as Endangered (EN B2b[ii,iv,v]). The species was originally discovered in a forested area that is not part of a protected conservation zone and is currently undergoing conversion into a tourism development site and near the oil palm plantations. This habitat disturbance poses a significant threat to the species, further justifying its pro-

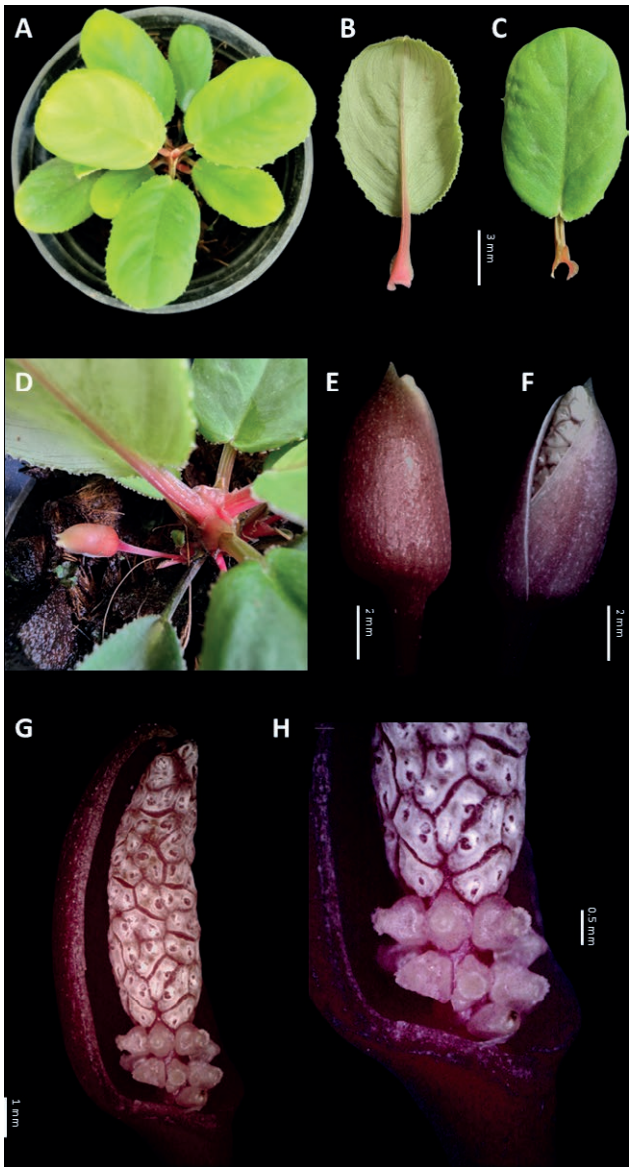

Figure 1. A. Habit; B-C. abaxial and adaxial leaf surface; D. Emerging inflorescense; E-F. Dorsal and Ventral view of spathe (28.2×); G. Spadix (half of spathe artificially removed, 36.6×); H. Close-up view of pistils (69.2×).

visional classification under the endangered status. The ongoing transformation of its natural environment into a commercial tourism area underscores the urgent need for conservation efforts to protect this newly described species and its fragile habitat.

Remarks

Homalomena siaisensis is placed within the Chamaecladon super group (SG) (Ng et al. 2011), a taxonomic assemblage characterized by a suite of shared

Figure 2. The type locality of *Homalomena siaisensis* near the Siais Lake, North Sumatra.

morphological traits. This placement is supported by the presence of a non-constricted spathe, the occurrence of 2–3 stamens per male flower, and the presence of a staminode within the pistillate zone—diagnostic features consistent with the Chamaecladon SG as defined by Ng et al. (2011).

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Nomenclatural adjustments in *Myriopus* (Heliotropiaceae)

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Abstract. Based on comparative morphological examinations of specimens available in both physical and digitized herbaria, a new combination is proposed in *Myriopus* (Heliotropiaceae): *Myriopus subulatus* (Gardner) J.I.M.Melo. Additionally, *Tournefortia lanceolata* Fresen. is synonymized under *M. subulatus*, with its effective lectotypification. Data on the distribution, habitat and reproductive phenology are provided for *M. subulatus*, as well as taxonomic notes based its morphological characters. *Myriopus breviflorus* (DC.) Luebert and *M. subulatus* are morphologically similar, and a key to their identifications is presented together with a list of the specimens examined.

Keywords: Boraginales, lectotype, nomenclature, Neotropics, *Tournefortia s.l.*

INTRODUCTION

Myriopus (Heliotropiaceae) was originally established by Small (1933) to encompass two species: *Myriopus poliochros* (Spreng.) Small and *Myriopus volubilis* Small. The genus is exclusively Neotropical and currently comprises approximately 40 species (Melo pers. obs.), with Brazil emerging as its main center of diversity with sixteen species (Cavalheiro et al. 2025 [continuously updated]).

Based on recommendations by Diane et al. (2002), *Myriopus* includes the species subordinated to *Tournefortia* L. sect. *Cyphocyema* I.M. Johnst. (Johnston 1930). The genus includes lianas or subscandent shrubs with supporting branches; leaves alternate to pseudo-opposite, elliptic, lanceolate to ovate or obovate; inflorescences axillary, lateral or terminal, generally with many-flowered secundiflorous branches, lax or congested; the fruits are fleshy and 4-lobed, with one seed per lobe that contains a curved embryo (Diane et al. 2016).

Recent contributions to the taxonomic diversity of *Myriopus* include: three proposed combinations (Melo 2019); a new Brazilian species (Melo et al. 2022); a new species and a new record from Colombia (Melo 2023); and the taxonomic treatments of *Myriopus* from Argentina (Simpson et al. 2022) and Brazil (Cavalheiro et al. 2025 [continuously updated]). Despite research

efforts focusing on *Myriopus* in South America, there are still nomenclatural issues and gaps regarding its representativeness.

Various species of *Tournefortia* were described for Brazil during the 19th century, including *T. lanceolata* (Fresenius 1857), which was synonymized under *T. breviflora* A.DC. (Johnston 1930).

During the preparation of the taxonomic revision of *Myriopus*, some synonymies were found to be associated with the taxonomically accepted concepts of the genera *Myriopus* and *Tournefortia*.

Morphological examinations indicated discontinuities between *Myriopus breviflorus* and *M. subulatus*, with the latter being combined here under *Myriopus*. The taxonomic limits of *M. subulatus*, an enigmatic species restricted to the Atlantic Forest of the southeastern region from Brazil, are elucidated here; additionally, the synonymization of *Tournefortia lanceolata* Fresen. under *M. subulatus* and a lectotype for *T. lanceolata* are proposed.

MATERIAL AND METHODS

Morphological analysis

During a visit to update the Heliotropiaceae collections of the Dimitri Sucre Herbarium (RB), Rio de Janeiro, Rio de Janeiro State, Brazil, comparative morphological analyses were undertaken of historical collections, including nomenclatural types and other important specimens. These analyses were complemented by studies at the Manuel de Arruda Câmara Herbarium (HACAM*), based on specimens available in the Reflora Virtual Herbarium and *SpeciesLink* databases. The acronyms of the herbaria follow Thiers (2025 [continuously updated]). *Herbarium not indexed.

The identification of *Tournefortia lanceolata* was based on Fresenius' monograph (1857); the identifications of *Myriopus breviflorus* and *M. subulatus* were based on the works of Miers (1868), Johnston (1930), and Cavalheiro et al. (2025 [continuously updated]). Protologues and nomenclatural types were consulted on the JSTOR Global Plants (2025 [continuously updated]) and Tropicos.org (2025 [continuously updated]) online databases.

The descriptive terminologies used follow Font Quer (1985) and Harris and Harris (2001). Regarding distribution of *Myriopus breviflorus*, one specimen was referred by federative unit within Brazil, and one specimen each indicated for Uruguay, Argentina, and Paraguay.

RESULTS AND DISCUSSION

Taxonomic notes

Myriopus subulatus (Gardner) J.I.M.Melo, **comb. nov.**

Bas.: *Messerschmidia subulata* Gardner, Lond. J. Bot. 1: 532. 1842.

Type: Brazil, Rio de Janeiro, Rio Comprido, September 1836, *G. Gardner 175* (holotype K000583440!; isotype BM001209045!).

(=) *Tournefortia gardneri* A.DC., Prodr. 9: 526. 1845. Type: Brazil, Rio de Janeiro, Rio Comprido, September 1836, *G. Gardner 175*.

(=) *Tournefortia lanceolata* Fresen., Fl. Bras. 8(1): 55-56. 1857, **syn. nov.**

Type: Brazil, Brasilia prov.: Rio de Janeiro ad rivum Tejuco, *C.F.P. von Martius 182*, s. dat. (lectotype M0188701!, here designated from *C.F.P. von Martius s.n.* [M]; isolectotypes M00188702!, M0188703!).

(=) *Myriopus gardneri* (A.DC.) J.I.M.Melo, Harv. Pap. Bot. 24(2): 245. 2019.

Distribution, habitat, and phenology

Myriopus subulatus is known only from conserved areas of Atlantic Forest in the state of Rio de Janeiro in southeastern Brazil (Fig. 1). The specimen *J.M. Braga 3632* (RB) was noted as growing in shaded environments of hillside forests. Based on the restricted geographic distribution of *M. subulatus*, it could soon be included in one of the threatened categories recognized by the International Union for Conservation Nature (IUCN). It was recorded flowering from August to December, and fruiting from October to December.

Notes

Messerschmidia subulata was originally described by Gardner (1842) based on a specimen he collected (*G. Gardner 175*). Two collections, however, were erroneously attributed to *G. Gardner 175* (Aspleniaceae [E01025639, E01025640, E01025641] and Myrsinaceae [NY495615, US1066290]).

Considering that George Gardner worked at the Edinburgh Botanic Garden Herbarium (E) at Edinburgh, his collections were searched for the original type specimen of *Messerschmidia subulata* that material, however, was not located. That same procedure was adopted

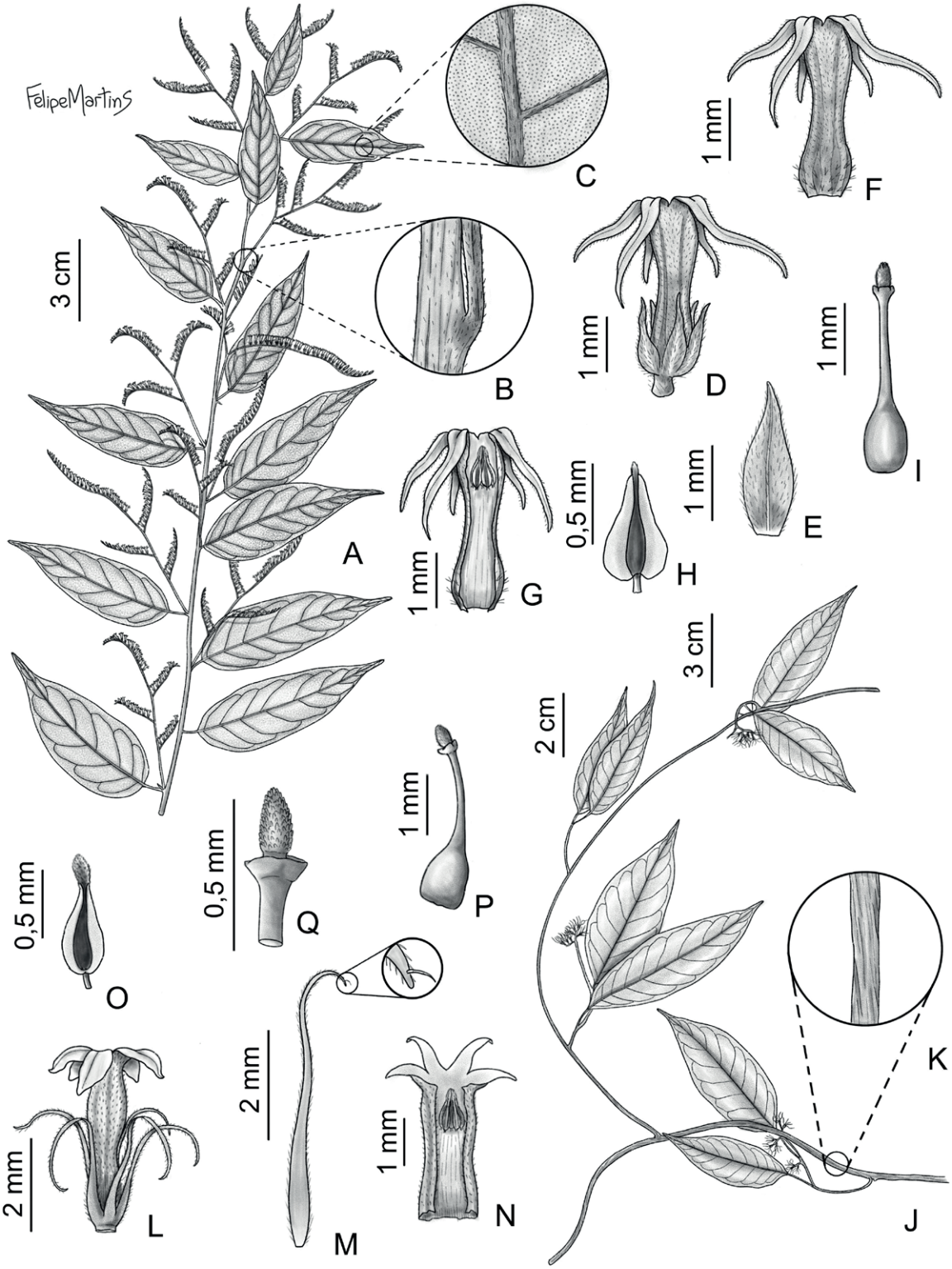

Figure 1. A–I. *Myriopus breviflorus* (A.DC.) Luebert. A. Reproductive branch. B. Detail of the stem. C. Detail of the leaf blade (adaxial face). D. Flower. E. Lacinia of the calyx. F. Corolla. G. Open corolla, showing the androecium. H. Stamen. I. Gynoecium (Drawn by F. Martins from *L.T. Dombrowski 14475* (MBM) and *A.A. Santos et al. 749* (SJRP)). J–Q: *Myriopus subulatus* (A.DC.) J.I.M. Melo. J. Reproductive branch. K. Detail of the stem. L. Flower. M. Lacinia of the calyx, uncinate trichome detached. N. Open corolla, showing the androecium. O. Stamen. P. Gynoecium. Q. Stigma, including part of the style (Drawn by F. Martins from *J.M.A. Braga 3632*).

in relation to *Tournefortia gardneri*, with the examination of collections in the G-DC Herbarium, Geneva Conservatory and Botanic Gardens. As the specimen that could have been used to propose *T. gardneri* was not located, De Candolle (1845) probably relied on the same basionym specimen to propose the replacement name in *Tournefortia*, based on the existence of *Tournefortia subulata* Hochst. ex DC. For these reasons, the specimens deposited in the K and BM herbaria are considered here as the holotype and isotype of *Messerschmidtia subulata* respectively.

Fresenius (1857) established *Tournefortia lanceolata* based on a collection made by Martius in the municipality of Rio de Janeiro, Brazil. However, Johnston (1930) synonymized *T. lanceolata* under *T. breviflora* (= *Myriopus breviflorus* (DC.) Luebert) without presenting the reasoning behind that decision.

Based on morphological examinations, *T. lanceolata* can be distinguished from *Myriopus breviflorus*, although the latter is very similar to *M. subulatus*, especially in terms of their general appearances (Fig. 1: J-Q). *Myriopus subulatus* is, however, an herbaceous vine, with inflorescences having villous peduncles and, due to its resupinate flowers, the calyx shows linear lacinia surpassing the corolla, corolla (ca. 4 mm long), villous, with narrow-elliptic lobes (ca. 1 mm long), style ca. 2 mm long, and an annular stigmatic disc, thickened, while *M. breviflorus* has exclusively lax inflorescences, with peduncles glabrescent, flowers elongated and pendulous, calyx approximately one-third of the corolla length, with ovate-elliptic lacinia, corolla (ca. 3 mm long), sericeous, with linear lobes (ca. 2 mm long), bifid trichomes on the basal portion, gynoecium erect, style ca. 1.3 mm long, and an obtriangular stigmatic disc. Table 1 lists the morphological differences between *Myriopus subulatus* and *M. breviflorus*, and their respective geographical distributions.

Table 1. Morphological differences between *Myriopus subulatus* and *M. breviflorus* and their geographical distributions.

Morphological features	Species	
	Myriopus subulatus	*Myriopus breviflorus*
Branches		
Vestiture	Glabrous	Pillous
Inflorescences		
Peduncles	Villous, ferruginous	Glabrescent
Flowers	Erect	Pendulous
Calyx		
Length	Surpassing the corolla length	Approximately one third of the corolla length
Lacinia shape	Linear	Ovate-elliptic
Corolla		
Length	Ca. 4 mm long	Ca. 3 mm long
Vestiture	Villous	Sericeous
Lobe shape	Narrow-elliptic	Lanceolate
Lobe length	Ca. 1 mm long	Ca. 2 mm long
Style		
Length	Ca. 2 mm long	Ca. 1.3 mm long
Stigmatic disc		
Shape	Annular	Obtriangular
Geographical distribution	Brazil (Rio de Janeiro State)	Brazil, Uruguay, Argentina, and Paraguay

Selected material examined

Myriopus breviflorus

BRAZIL: Distrito Federal: Brasília, 28 September 2000 (fl., fr.), *A.A. Santos et al. 749* (CEN, HACAM). **Paraná:** Colombo, 12 April 1980 (fl.), *L.T. Dombrowski 13475* (MBM). **Rio de Janeiro State:** Ex sylvis montanis Brasiliae prope Petropolis, 10-12 July 1882 (fl.), *J. Ball s.n.* (NY02398756). **Rio Grande do Sul:** Camaquã, 31 October 1989 (fl.), *J.A. Jarenkow & J.L. Waechter 1376* (CRI). **Santa Catarina:** Pirão Frio, 11 July 1959 (fl.), *R. Reitz & M. Klein 8923* (NY). **São Paulo State:** São Simão, Fazenda Bocaína, 29 September 1960 (fl.), *J. Mattos 8670* (SP). **Tocantins:** São Salvador do Tocantins, margem esquerda do rio Tocantins, próximo à ponte sobre o rio do mesmo nome, rodovia TO-387, 12º44'51"S, 48º15'15"W, 29 September 2007 (fl.), *G. Pereira-Silva et al. 12157* (CEN, HACAM). URUGUAY: **Cerro Largo:** Sarandí de Barceló, 9 January 1980 (fl., fr.), *R. Brescia et al. 26* (MVFA). ARGENTINA. **Misiones:** Departamento Guaraní, Prédio Guaraní, 26º54'59"S, 54º12'18"W, Camino al ayo. Soberbio, borde de selva, 17 September 1998 (fl.), *S. Tressens et al. 6081* (CTES, MBM). PARAGUAY. **Departamento Cordillera:** Itacurubí de la Cordillera, 28 March 1978 (fl., fr.), *T. Pedersen 1090* (L).

Material examined

Myriopus subulatus

BRAZIL: Rio de Janeiro State: Rio de Janeiro, Corcovado, s. dat. (fl.), *A.F.M. Glaziou 19682* (P03525468, P03525469); idem, September-October 1832, fl., *L. Riedel & B. Luschnath 890* (NY); idem, Environs de Rio de Janeiro, 1843 (fl.), *H.A. Weddell 237* (P); idem, Botafogo, Mundo Novo, 19 September 1920 (fl.), *J.G. Kuhlmann 16266* (RB); idem, Represa Camorim, 1933 (fl.), *A.C. Brade 12781* (RB); idem, Sumaré, October 1933 (fl.), *A.C.*

Figure 2. Lectotype of *Tournefortia lanceolata*. Reproduced with permission [*C.F.P. von Martius s.n.* (M0188701)].

Brade 12805 (RB); idem, Corcovado, 13 August 1946 (fl.), *A.P. Duarte & P. Occhioni 209* (RB); idem, Botafogo, 3 September 1967 (fl.), *D. Sucre 1609* (RB); idem, Parque Laje, 11 October 1967 (fl.), *D. Sucre 1665* (NY, RB); idem, Matas do Corcovado, 22 October 1969 (fl., fr.), *D. Sucre 6110* (RB, SJRP); idem, Parque Nacional da Tijuca, Trilha para o Morro da Cocanha (Alto da Boa Vista), 1 November 1996 (fl., fr.), *J.M. Braga 3632* (RB); idem, Parque Municipal Ecológico da Prainha, entre o mirante do Cruzeiro do Sul e o Morro dos Caetés, 13 November 2003 (fl., fr.), *J.M.A. Braga et al. 7277* (NY, RB). Niterói, Parque Estadual da Serra da Tiririca, Morro do Telégrafo, Trilha da Barreira, 30 October 2005 (fl., fr.), *A.A.M. Barros et al. 2411* (RB, RFFP); idem, Parque Natural Municipal de Niterói, 22°55'18,17"S, 43°04'39.54"W, 223 m.s.m., 21 December 2016 (fl., fr.), *D.N.S. Machado et al. 1109* (RB, RFFP).

Key for *Myriopus breviflorus* and *M. subulatus*

1. Branches glabrous; inflorescences with peduncles villous, ferruginous; flowers erect; calyx surpassing the corolla length, lacinia linear; corolla ca. 4 mm long, villous, narrow-elliptic lobes ca. 1 mm long; style ca. 2 mm long; annular stigmatic disk ..... ***M. subulatus***

1. Branches pillous; inflorescences with peduncle glabrescent; flowers pendulous; calyx approximately one third of the corolla length, lacyniae ovate-elliptic; corolla ca. 3 mm long, sericeous, lanceolate lobes ca. 2 mm long; style ca. 1.3 mm long; obtriangular stigmatic disc ..... ***M. breviflorus***

Lectotypification

In his original publication, Fresenius (1857) designated the specimen '*Ad rivum Tejuco; prov. Rio de Janeiro, M.*' as the basis for establishing *Tournefortia lanceolata*. That author did not, however, mention the collector number – and there are three sheets in the Munich Herbarium, Munich, Germany belonging to the same collection series (*C.F.P. von Martius 182*). Examinations of these materials revealed that the sheets labeled M0188701, M0188702, and M0188703 served as the basis for the original description, and that the material M0188701 was used to prepare the Indian ink drawing (Plate t.12) in the "*Flora Brasiliensis*" (Fresenius 1857). Based on these facts, sheet M0188701 is designated here as the lectotype for *T. lanceolata* (Fig. 2).

Material examined

Tournefortia lanceolata

BRAZIL: Rio de Janeiro State. Brasilia Provinc. Rio de Janeiro ad rivum Tejuco, s. dat. (fl.), *C.F.P. von Martius 182* (M0188701, M0188702, M0188703).

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New Record of *Sarga purpureosericea* (Hochst. ex A.Rich.) Spangler (Poaceae) for the Flora of Saudi Arabia and second-step lectotypification of the name

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Abstract. During recent botanical expeditions in the northwestern Saudi Arabia, *Sarga purpureosericea* Spangler was recorded and collected for the first time in the country. This finding enriches Saudi Arabia's grass flora and highlights the importance of further botanical exploration. We formally include this species in the national flora, supported by a voucher specimen deposited at the University of Porto Herbarium (PO). This record bridges a significant biogeographical gap between eastern Africa and the Indian subcontinent. Additionally, we provide a second-step lectotypification of the name. The original lectotypification, based on specimens housed at the Kew Herbarium (K) and the Missouri Botanical Garden Herbarium (MO), constitutes a first-step designation under Article 9.17 of the ICN. We now designate a second-step lectotype that aligns more precisely with Spangler's original intent.

Keywords: Andropogoneae, lectotype, nomenclature, *Sarga, Sorghum,* taxonomy.

INTRODUCTION

Sarga purpureosericea (Hochst. ex A.Rich.) Spangler (Fig. 1) is an annual grass belonging to the tribe Andropogoneae Dumortier (1824). Its taxo-

nomic history is closely linked to the reclassification of species within the *Sorghum* complex (Spangler 2003). Initially described as *Andropogon purpureosericeus* Richard (1850), the species was later placed within *Sorghum* Moench (1794), where it remained for much of the 20th century. However, molecular and morphological studies suggested that *Sorghum*, as traditionally defined, was not monophyletic. Consequently, Spangler (2003) reinstated the genus *Sarga* Ewart (1911) to accommodate species formerly classified under *Sorghum* subgenera *Parasorghum* Snowden (1932) and *Stiposorghum* Garber (1950).

This reclassification recognized three evolutionary lineages within *Sorghum* sensu lato: *Sorghum* sensu stricto, which encompasses the cultivated *S. bicolor* and its closest wild relatives; *Sarga*, comprising species characterized by distinct inflorescence morphology; and *Vacoparis* Spangler (2003), a newly proposed genus that includes specific Australasian taxa (Spangler 2003). This reassessment highlights the need to integrate phylogenetic, morphological, and cytological data in grass taxonomy.

This study aims to (i) report the first occurrence of *Sarga purpureosericea* in Saudi Arabia and (ii) propose a second-step lectotypification to stabilize the taxonomic usage of the name, in line with the principles outlined by the International Code of Nomenclature for algae, fungi, and plants (Turland et al. 2025).

MATERIALS AND METHODS

The specimen of *Sarga purpureosericea* was collected in 2025 during a botanical field survey in the Jabal Ral Key Biodiversity Area, northwestern Saudi Arabia, as part of an ongoing biodiversity assessment supported by Red Sea Global (RSG-RSZ). Standard collection methods were applied, and the specimen was carefully preserved, photographed, and analyzed morphologically.

Although only one individual was collected in the field, it exhibited tussock-forming growth and multiple culms. This allowed the preparation of two complete herbarium sheets. One was deposited at the PO herbarium of the Natural History and Science Museum of the University of Porto (Portugal), and the other at the MUZ herbarium of King Abdulaziz City for Science and Technology (Saudi Arabia).

Morphological analyses were conducted using both fresh and preserved material, as well as *in situ* images. Comparative evaluation was performed against herbarium specimens from K and MO, as well as relevant taxonomic literature. Regional floras consulted included the Flora of Tropical East Africa, Flora of Ethiopia and Eritrea, Flora of Egypt (Boulos 2009), Flora of Pakistan (Nasir and Ali 1972–1994), and Analytical Flora of Eretz-Israel (Danin and Feinbrun-Dothan 1991), among others. These floras were used to compare macro-morphological features and distributional notes. Taxonomic decisions also considered modern phylogenetic frameworks and historical nomenclatural treatments (Garber 1950; Spangler 2003).

A detailed comparative assessment was conducted by confronting the original protologue with the available type-relevant specimens housed at the Kew Herbarium (K) and Missouri Botanical Garden (MO). This involved cross-checking diagnostic elements such as collector name, collection date, locality, and original binomial cited by the protologue to identify material that constitutes original material sensu ICN (Art. 9.4; Turland et al. 2025). This procedure allowed for the substantiated designation of a second-step lectotype that best reflects the original author's intent.

The typification was based on a comparative analysis between the protologue of *Andropogon purpureosericeus* Hochst. ex A.Rich. and original material from the *Schimper 1551* collection, examined at the Royal Botanic Gardens, Kew (K), the Missouri Botanical Garden (MO), and via online databases.

RESULTS

Taxonomic and nomenclatural background

Sarga purpureosericea (Hochst. ex A.Rich.) Spangler, Austral. Syst. Bot. 16: 291. 2003.

(≡) *Andropogon purpureosericeus* Hochst. ex A.Rich, Tent. Fl. Abyss. 2: 469. 1850.

(≡) *Sorghum purpureosericeum* (Hochst. ex A.Rich.) Schweinf. & Asch., Bei tr. Fl. Aethiop.: 310. 1867.

(=) *Andropogon purpureosericeus* var. *calomelas* Hack. in A.L.P.P. de Candolle, Monogr. Phan. 6: 525. 1889.

(=) *Andropogon purpureosericeus* var. *pallidior* Hack. in A.L.P.P. de Candolle, Monogr. Phan. 6: 525. 1889.

(=) *Andropogon pappii* Gand., Bull. Soc. France 66: 298. 1919.

(=) *Sorghum dimidiatum* Stapf in D.Oliver & auct. suc. (eds.), Fl. Trop. Afr. 9: 140. 1917.

(≡) *Sorghum purpureosericeum* subsp. *dimidiatum* (Stapf) E.D.Garber, Univ. Calif. Publ. Bot. 23: 328. 1950.

Figure 1. a) Specimen of *Sarga purpureosericea* (Hochst. ex A.Rich.) Spangler: PO-V73041 (Porto University, Natural History and Science Museum); b), c) details of the species in the natural habitat at Jabal Ral Key Biodiversity Area, Red Sea Zone, north-western Saudi Arabia; d) detail of densely bearded nodes with stiff white hairs.

(=) *Sorghum deccanense* Stapf ex Raizada, Indian Forester 80: 43. 1954.

(≡) *Sorghum purpureosericeum* subsp. *deccanense* E.D.Garber, Univ. Calif. Publ. Bot. 23: 328. 1950

Distribution and habitat

Sarga purpureosericea (A.Rich.) Spangler, has a broad but disjunct distribution extending across the northern Rift Valley system of eastern Africa and into southwestern Asia. It is recorded in Uganda, Ethiopia, Eritrea, eastern Sudan, the Deccan Plateau (India), and recently southern Arabian Peninsula (Clayton 2008; POWO 2025). The species typically occupies semi-arid to arid regions, with rocky or sandy substrates, temporary streambeds, and seasonally flooded areas (Spangler 2003). Its discovery in Saudi Arabia (Fig. 2) complements the known latitudinal distribution of the species between north-eastern Africa and the Indian subcontinent, bridging the biogeographical gap across the northern part of the Afro-Arabian region. This record may represent either a previously overlooked native population or a recent long-distance dispersal event. Historical confusion with morphologically similar taxa, such as *Sarga versicolor* (Andersson) Spangler (2003: 294), may have obscured its actual range (Garber 1950).

In Saudi Arabia, the species was recorded within the Tropical Xeric bioclimate, Antitropical Variant (Rivas-Martínez et al. 2011), specifically at the Jabal Ral Key Biodiversity Area in the Red Sea Zone (RSZ) (El-Bana et al. 2025). It inhabits a geomorphological setting characterized by a rocky drainage channel that forms ephemeral ponds and eventually feeds into a temporary streambed (wadi) (Fig. 3). This landscape reflects a dynamic hydrological regime, likely shaped by irregular and highly seasonal rainfall within the watershed (Al-Rowaily et al. 2012). The site hosts a sparse yet diverse xerophytic flora encompassing various growth forms, including shrubs (e.g. *Hibiscus micranthus* L., subshrubs (e.g.

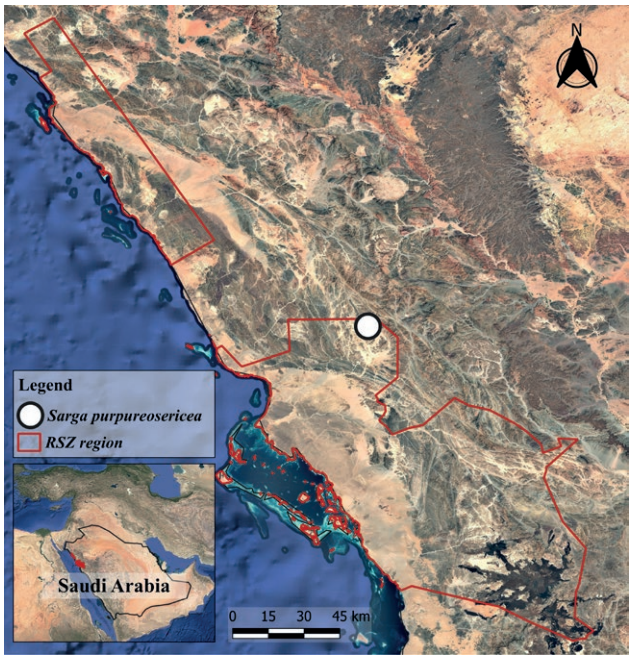

Figure 2. Study area and location of *Sarga purpureosericea* in Jabal Ral Key Biodiversity Area of Red Sea Zone.

Figure 3. Global overview of the habitat of *Sarga purpureosericea* in Jabal Ral, Red Sea Zone, northwestern Saudi Arabia.

Tephrosia purpurea (L.) Pers. subsp. *apollinea* (Delile) Hosni & El-Karemy), and herbs (e.g. *Spergularia flaccida* (Madden) I.M.Turner, *Galium setaceum* Lam., *Rumex vesicarius* L., indicating a vegetation community adapted to brief pulses of moisture within predominantly arid conditions (Figs 1–3).

Despite similar habitats in the region, only a single individual was located, suggesting that this population may be either relictual or recently established. Although only one plant was found, its tussock-forming growth allowed for the preparation of two complete herbarium specimens from different portions of the same individual, which were deposited in separate herbaria. The rarity of the species in Saudi Arabia may stem from ecological specialization or under-sampling due to cryptic morphology or phenology. The co-occurrence of taxa with wide-ranging xeric chorotypes points to underlying habitat and floristic heterogeneity, emphasizing the ecological complexity behind the elusive distribution of this species (Fig. 3).

Conservation status

Main threats include herbivory by free-ranging camels, sheep, and goats, which exert heavy grazing pressure in desert habitats (Abulfatih 1992; Moustafa 2001; Al-Rowaily et al. 2012; Al-Rowaily et al. 2015). The absence of additional individuals in ecologically comparable sites may reflect a relictual distribution or recent establishment. Alternatively, this scarcity might be linked to undetected microhabitat constraints or phenological invisibility during sampling.

Given the extremely limited area of occupancy, low number of individuals, and exposure to ongoing threats, *Sarga purpureosericea* may fall within a threatened category under IUCN Red List criteria (IUCN Standards and Petitions Committee 2022). Although the species is currently listed as Least Concern on the global IUCN Red List due to its broader range across eastern Africa and southern Asia (Contu 2013), the newly discovered Saudi Arabian population appears to be highly localized and potentially vulnerable. Further surveys are needed to confirm presence and assess population dynamics. Until then, it should be considered for future inclusion in the Saudi Arabian Red List of Vascular Plants (Thomas et al. 2021). A duplicate specimen is deposited at the King Abdulaziz City for Science and Technology herbarium (MUZ).

Typification

A first-step lectotypification of Andropogon purpureosericeus Hochst. ex A.Rich. (Richard 1850) was previously proposed by Spangler (2003), who cited original material from the Royal Botanic Gardens, Kew (K), and the Missouri Botanical Garden (MO), but without specifying a particular specimen. In accordance with Article 9.17 of the International Code of Nomenclature for algae, fungi, and plants (Turland et al. 2025), we here designate K000280777 (K) as the second-step lectotype

Figure 4. Types: a) Lectotype of *Sarga purpureosericea* (K000280777!). © The Board of Trustees of the RBG, Kew. http://specimens.kew.org/herbarium/K000280777; isolectotypes: b) (K000280778!). © The Board of Trustees of the RBG, Kew. http://specimens.kew.org/herbarium/K000280778 and c) (MO-015407!). Image courtesy of Missouri Botanical Garden Herbarium (https://tropicos.org/specimen/998943).

of Sarga purpureosericea. Among the original material cited by Spangler, specimens K000280778 (K) and MO-015407 (MO), belonging to the same Schimper 1551 gathering, are accordingly considered isolectotypes.

Digital duplicates of additional specimens from the same gathering were located through online repositories in the following herbaria: BR, FI, G, GOET, HOH, LG, M, MPU, P, PRE, S, STU, TUB, and W. Although not examined physically, these materials match the lectotype in collector, date, and locality, and therefore also qualify as isolectotypes, further supporting the typification and ensuring nomenclatural precision.

Discussion

The specimen collected from Jabal Ral was identified as *Sarga purpureosericea* based on full agreement with the protologue and comparison with original material. The plant exhibits narrow, linear-lanceolate leaves with silky-pubescent sheaths, and a contracted terminal panicle that is often partially enclosed by the uppermost leaf sheath, as typical features of the species. Its long-exserted racemes are purple-silvery and distinctly plumose, with dimorphic spikelets: lanceolate, awned sessile spikelets, and sterile, densely pilose pedicellate spikelets. These traits, in combination, distinguish *S. purpureosericea* from other *Sorghum*-like grasses occurring in the region. The Saudi Arabian material matches both the morphology and ecological preference described for the species elsewhere, confirming its identity and supporting the range extension into the Arabian Peninsula.

The discovery of *Sarga purpureosericea* in northwestern Saudi Arabia significantly enhances our understanding of the species' biogeographic range. This record not only fills a distributional gap between East Africa and the Indian subcontinent but also raises questions about the species' dispersal mechanisms and historical presence in the Arabian Peninsula. Given the region's role as a migratory corridor and its complex climatic history, the species' occurrence may reflect either a relict population or a more recent colonization event facilitated by hydrochory or zoochory.

The second-step lectotypification presented here ensures congruence with the original intent of Spangler (2003) and aligning with the ICN's provisions. The name *Sarga purpureo-sericeum* (Spangler 2003) required correction under the International Code of Nomenclature for algae, fungi, and plants (ICN). The original basionym, *Andropogon purpureo-sericeus*, includes a hyphenated compound epithet, which is not permitted under Article 60.9 of the ICN. This article mandates that hyphens in compound epithets must be deleted unless the components normally stand as independent words or when the same letter occurs on either side of the hyphen. In this case, *purpureo-sericeus* is a compound of two combining forms and does not meet the

exceptions. Therefore, the epithet was corrected to *purpureosericeus*. Upon transferring the species to the feminine genus *Sarga*, the epithet must also agree in gender, resulting in the correct name *Sarga purpureosericea*. Future phylogenomic approaches could test the genetic distinctiveness of Arabian populations relative to African and Indian lineages, potentially revealing hidden evolutionary structure.

From a conservation perspective, the apparent rarity of the species, combined with anthropogenic pressures such as grazing, warrants immediate monitoring. Although currently only a single individual has been observed, it may represent a small, overlooked population rather than an isolated occurrence. Further systematic surveys across similar habitats in the Red Sea Zone and adjacent bioregions are essential.

In summary, this new record underscores the importance of continued floristic exploration in undersurveyed arid regions, where overlooked taxa may provide critical insights into historical biogeography, taxonomy, and conservation priorities.

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