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The genus *Polystichum* (Dryopteridaceae) in Africa

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CONTENTS

SYNOPSIS. *Polystichum* Roth is a fern genus of 160 to 200 species occurring throughout the temperate parts of the world and the montane tropics, but absent from the arid regions as well as the lowland tropics. Although floristic accounts of *Polystichum* exist for many parts of the world, the genus remains poorly understood and a taxonomic account for the group as a whole has never been undertaken. *Polystichum* is poorly represented in Africa (including the Marion Island group) with merely 16 species and one known hybrid having been recorded from the region. Most of the species are confined to sub-Saharan Africa, occurring mainly along the eastern mountain ranges and Mt. Cameroon in the west. In this review of the African *Polystichum* species detailed observations are presented especially on the paleae, as these structures were found to provide the best characters on which a subgeneric classification can be based. Diagnostic features and relationships, variation, and the distribution and ecology of each species are included.

INTRODUCTION

The genus *Polystichum* Roth consists of between 160 (Tryon & Tryon, 1982) and 200 (Daigobo, 1972) species. It occurs throughout the temperate parts of the world as well as the montane tropics, but is mostly absent from the lowland tropics. Within the range two distinct centres of diversity can be identified, namely a larger Asiatic centre with approximately 70 species and a tropical American centre with approximately 55 species. Both these regions fall within the mountainous tropics characterized by mild, moist climates that are hardly seasonal. They also correspond with the areas of highest species diversity for homosporous ferns (Tryon, 1985).

Within the Dryopterideae *Polystichum* is most closely related to *Arachniodes* Blume, *Cyrtomium* C. Presl, *Dryopteris* Adans. and *Phanerophlebia* C. Presl. *Cyrtomium* and *Phanerophlebia* have often been included in *Polystichum* (Kramer, 1990), but it has subsequently been shown that both these genera have a closer affinity to *Polystichum* than to each other (Yatskievych, 1996).

Polystichum in a strict sense is a natural and relatively homogeneous group of plants characterized by 1-pinnate to 3-pinnate laminae with acroscopically developed ultimate segments, anadromous free venation, uni- or biseriate circular sori positioned medially, terminally or near terminally on abbreviated or unabbreviated vein branches, and peltate indusia (a number of species are exindusiate). The receptacle appears to be nude in most species.

Although *Polystichum* as a genus is easily recognized, many species are superficially very similar. The delimitation of species is further hampered by the fact that many, mostly common species are allopolyploids (Vida & Reichstein, 1975; Wagner, 1979). Also the frequent occurrence of F1-hybrids in some groups obscures species limits.

A formal subgeneric classification for the genus has thus far only been provided for the east Asian species by Tagawa (1940) and Daigobo (1972). Some of these sections have since been subdivided further by Zhang & Kung (1995, 1996*a*, *b*) and Kung & Zhang (1998) to make provision for some of the Chinese species. Since most species remain poorly known a phylogeny for the genus cannot be proposed.

Although floristic accounts of the genus have been published for many parts of the world, some being very old and outdated, no single monographic treatment exists and most species remain poorly known. Some of the modern-day regional treatments provide no detailed observations that may suggest affinities. Within the study area floristic accounts for *Polystichum* are available for North Africa (Maire, 1952), West tropical Africa (Alston, 1959), Cameroon (Tardieu-Blot, 1964), Mozambique, Malawi, Zambia and Zimbabwe (Schelpe, 1970), Rwanda, Burundi and Kivu (Democratic Republic of Congo) (Pichi Sermolli, 1985), southern Africa (Schelpe & Anthony, 1986) and Bioko (Benl, 1991).

It is a well-known fact that Africa, when compared with other tropical parts of the world, supports a floristically impoverished vascular flora. This phenomenon is also reflected in the pteridophyte flora of the continent. The cause of this floristic poverty is ascribed to the isolation of Africa from the other continents since the mid-Cretaceous and the subsequent significant changes in the climate as a result of uplift, continental drift and aridification caused by extra-tropical glaciation. All these changes may well have resulted in a

progressive elimination of the once rich tropical and subtropical forests that existed towards the late Jurassic and the establishment of extensive deserts and semi-deserts by the early Pliocene (Coetzee, 1993).

Within the study area two regions can be identified: an African and a sub-Antarctic region. The origin, composition and floristic affinities of these regions differ markedly. The African region is the largest and today there are three fundamentally different floras or biogeographical subregions which can be identified: a southern African flora, a tropical African flora and a North African flora.

The flora of the southern African subregion is believed to have evolved gradually since the mid-Tertiary, derived partly from an ancient southern African temperate flora and partly from a tropical African forest flora (Goldblatt, 1978). Elements of the southern African flora currently extend into tropical Africa along the eastern escarpment. The southern Cape forests are believed to be impoverished remnants of the tropical African forest flora (Coetzee & Muller, 1984). Also the tropical African flora is believed to be an impoverished remnant of a once much richer tropical rainforest flora that extended over a far greater area than it currently occupies.

North Africa has also experienced significant changes in its climate and vegetation. During the Palaeocene the present Sahara desert was clothed by a rich tropical lowland rainforest that also covered part of Europe (Greenway, 1973; Raven & Axelrod, 1974), but by the Oligo-Miocene it was replaced by a subtropical woodland savanna (Axelrod & Raven, 1978). From the Pliocene a desert climate established itself in the major part of the Sahara (Quézel, 1978), serving as an effective barrier to migration from the south. The formation of glaciers on the high mountains during the Pleistocene permitted the establishment of circumboreal elements. Many of these elements are present in the North African flora since it is composed of relict elements of African origin as well as elements from Eurasia, not frequent in the present sub-Saharan flora. The mediterranean influence on the flora of North Africa justifies it being considered as a biogeographical subregion of its own.

The Marion and Prince Edward Island group forms part of the sub-Antarctic region, a phytogeographical area completely different from the foregoing. This island group is of volcanic origin and is estimated to be 0.5 million years old (Verwoerd, 1971). Situated in the Southern Ocean some 1800 km from Africa, its biota consists of taxa capable of long-distance dispersal and the ability to establish themselves in habitats not always favourable for plant growth.

About two-thirds of the African pteridophytes are limited in their occurrence to the continent (Kornas, 1993). The majority of these, however, are closely related to taxa in either tropical America and/or southeast Asia. Pteridophytes of the sub-Sahara biogeographical region exhibit three discontinuous distribution patterns: an American-African disjunction, an African-Madagascan disjunction and an African-Asian disjunction.

Polystichum in Africa is largely confined to the Afromontane Phytochorion. White (1978) divided this montane archipelago into seven regional mountain systems. The North African Atlas mountain ranges are here added as an eighth. Although the sub-Saharan mountain ranges are sufficiently distinct, the systems are connected by a complex series of intermediate floras (Fig. 1). The Drakensberg system, with six *Polystichum* endemics, is the richest. This is also true for the angiosperms (White, 1978). The only other mountain systems with true endemics are the Imatongs-Usambara system with two endemics (*P. kilimanjaricum* & *P. volkensii*) and the Ethiopian system with one endemic (*P. magnificum*). Other African *Polystichum* species have wider distributions. *Polystichum zambesiacum* occurs in the Chimanimani, Uluguru-Mulanje, and Imatongs-Usambara mountain systems, whilst *P. transvaalense* and *P. wilsonii* are distributed throughout seven mountain systems. The distribution of *P. wilsonii*, however, also extends along the Himalaya mountains to Bhutan, Japan and Taiwan. *Polystichum luctuosum* has an almost similar eastern distribution but is confined to the Drakensberg and Chimanimani mountain systems in Africa. *Polystichum luctuosum* and *P. wilsonii* also show a disjunct distribution with the Madagascan region.

Based on observations taken from the systematic treatment, and judging from wide-ranging species, southern and tropical African *Polystichum* has a closer affinity with taxa from Asia than with those from the Americas. *Polystichum* in the North African phytogeographical subregion shows a closer affinity with *Polystichum* from Europe than from Africa as *P. aculeatum* and *P. setiferum* are widespread in that region. Only *P. marionense*, endemic to Marion, Prince Edward and Crozet Islands, occurs in the sub-Antarctic phytogeographical region.

MATERIALS AND METHODS

This review is based on observations made during extensive fieldwork in southern Africa and on cultivated plants collected during these travels. The collections of several herbaria were also studied. These include: B, BM, BOL, BR, ETH, GRA, K, L, M, MAL, NBG, NH, NU, P, PRE, RAB, SAM, SRGH, WAG (abbreviations follow Holmgren et al., 1990) and the private herbarium of Prof. R.E.G. Pichi Sermolli (PIC.SERM.).

Palea and indusium observations were made by removing a small number of these structures from selected specimens. These were cleaned and cleared in diluted household bleach, after which they were semi-permanently mounted in glycerine and the cover slips sealed with Entellan. Observations were made with an Olympus CH-2 light-microscope fitted with a drawing tube.

The collections studied are all listed under 'Material examined'. These are arranged alphabetically according to country of origin. South African (including Lesotho and Swaziland) collections are further arranged according to the quarter-degree square-grid system (Edwards & Leistner, 1971). In this system each one-degree square is known by a standardized name, derived from a town or other feature of importance in the square. Each one-degree square is divided into four half-degree squares (30′ × 30′), numbered A, B, C and D from left to right and top to bottom. Each half-degree square is again subdivided into quarter-degree squares (15′ × 15′), again numbered A, B, C and D. By using these co-ordinates a geographical area can immediately be identified.

Unless cited otherwise, the chromosome numbers provided here are based on the author's own observations and will be published elsewhere.

Terminology

This study is principally based on a detailed comparative morphological analysis of the sporophyte, where palea structure proved to be most informative in suggesting species groups. The terms used to describe the apex or the apical cell of the paleae are defined as:

- apex flagelliform: the apex of the palea terminates in a uniseriate series of slender cells.
- subulate cell: the apical cell is less than 0.4 mm long and the apex is usually blunt.
- acicular cell: the apical cell is slender, straight, more than 0.4 mm long, and the apex is usually sharp.

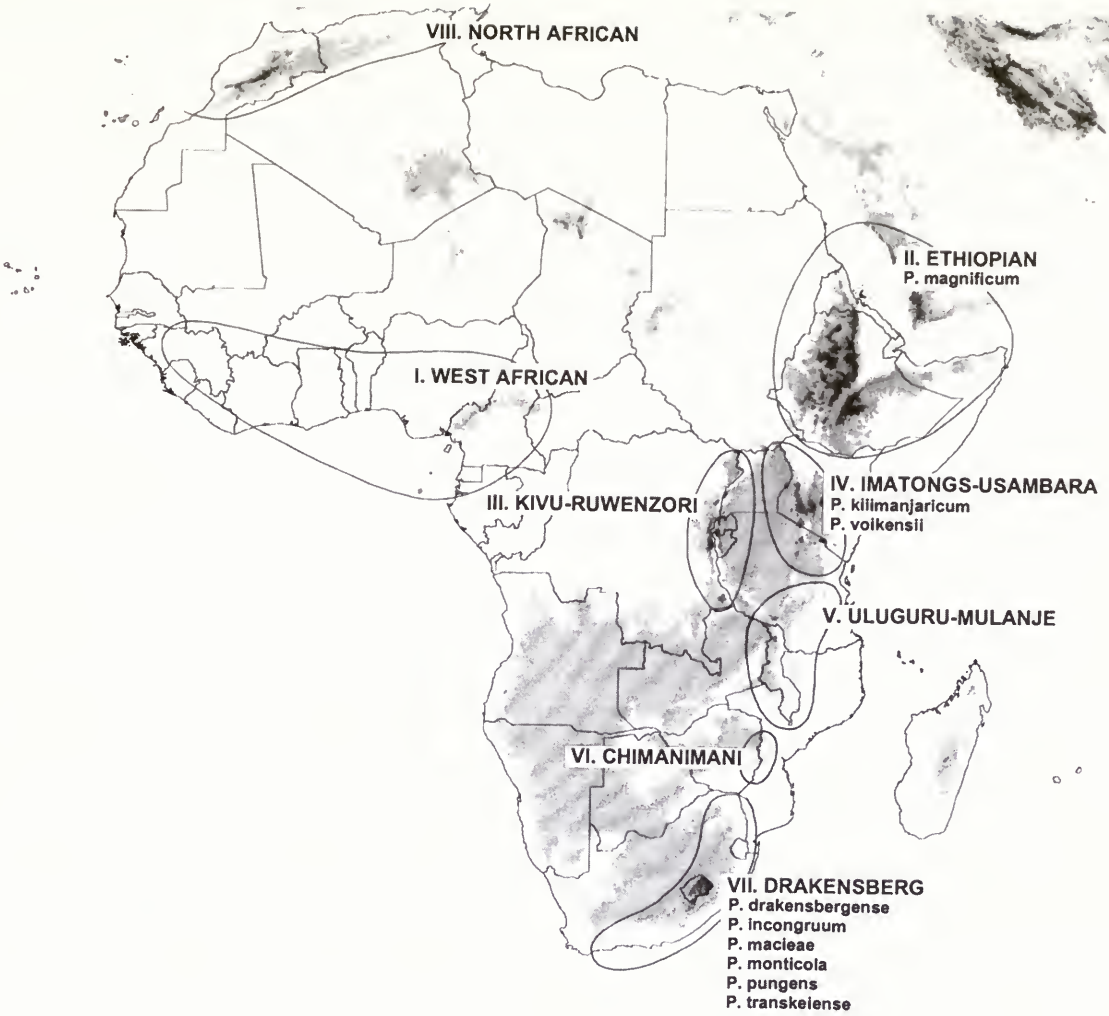

Fig. 1 Distribution of *Polystichum* in Africa.

- filiform cell: the apical cell is slender, twisted, and more than 0.6 mm long.
- thin-walled cell: these cells can vary considerably in size and the cell wall is conspicuously thinner than that of the surrounding cells, and is therefore often lost. In dry material the cellular contents are usually yellowish in colour and appear crystalline.

TAXONOMIC TREATMENT

Polystichum Roth, *Tent. fl. Germ.* **3**: 31, 69 (1799). Type species: *Polystichum lonchitis* (L.) Roth (= *Polypodium lonchitis* L.).

Hypopeltis Michx., *Fl. bor.-amer.* **2**: 266 (1803). Type species: *Hypopeltis lobulata* Bory (= *Polystichum aculeatum* (L.) Roth).

Plecosorus Fée, *Mém. foug.* **5**: 150 (1852). Type species: *Plecosorus mexicanus* Fée, nom. superfl. for *Cheilanthes speciosissima* Kunze (= *Polystichum speciosissimum* (Kunze) R.M. Tryon & A.F. Tryon).

Sorolepidium H. Christ in *Bot. Gaz.* **51**: 350 (1911). Type species: *Sorolepidium glaciale* (H. Christ) H. Christ (= *Polystichum glaciale* H. Christ).

Hemesteum H. Lév., *Fl. Kouy-Tchéou*: 450, 496 (1915), non Newm. (1851). Type species: several *Polystichum* species are listed.

Aetopteron House in *Amer. Fern J.* **10**: 88 (1920), nom. nud.

Papuapteris C. Chr. in *Brittonia* **2**: 300 (1937). Type species: *Papuapteris linearis* C. Chr. (= *Polystichum lineare* (C. Chr.) Copel.).

Acropelta Nakai in *Bull. Natl. Sci. Mus. Tokyo* **33**: 5 (1953). Type species: *Acropelta omeiensis* (C. Chr.) Nakai (= *Polystichum omeiense* C. Chr.).

Plants terrestrial, or epilithic, rarely low-level epiphytes. *Rhizome* erect to suberect and mostly unbranched, or creeping, or decumbent and branched; rarely stoloniferous; dictyostelic; set with roots, closely to widely spaced persistent stipe bases, and paleae. *Fronds* monomorphic, caespitose or closely to widely spaced, to 1.8 m long: *stipe* proximally convex adaxially, becoming slightly to deeply sulcate distally; with two larger near-circular vascular bundles dorso-laterally, ventrally with three to five smaller circular vascular bundles; initially moderately to densely paleated, becoming near glabrous later, the paleae often appearing heteromorphous, variable: *lamina* 1-pinnate to 3-pinnate, anadromous, sometimes bearing 1 to several paleated proliferous buds adaxially along the rachis near the

lamina apex: *rachis* adaxially shallowly to deeply sulcate, the sulcus proximally not open to sulci of lower order axes, moderately to densely paleated; paleae variable: *pinnae* short-stalked, opposite to alternate, closely to widely spaced, often imbricate, simple to 2-pinnate, acroscopically auricled: *pinna-rachis* adaxially sulcate, open to sulci of costae, sparsely to densely paleated; paleae variable: *pinnules* proximally mostly short-stalked, opposite to alternate, closely to widely spaced, often imbricate, the proximal acroscopic pinnule mostly longer than the next in 2-pinnate or more dissected species, herbaceous to firmly coriaceous, inaequilateral, ovate to ovate-rhomboid or trullate, often somewhat falcate, mostly acroscopically auricled in 2-pinnate or more dissected species, lobate, dentate or serrate, sharp-tipped or aristate; variously paleated. *Venation* free, pinnately branched, anadromous, terminating near or at the margin when sterile, immersed or raised. *Sori* circular, essentially uniseriate, borne medially on unabbreviated vein branches, or near or at a vein ending of mostly anadromous vein branches: *sporangium* with 8–(13)–30 indurated annulus cells; stalk with glandular cells or eglandular, 3-seriate below capsule: *indusium* absent or present, peltate, mostly persistent, the margin variously sculptured, with or without gland-like cells. *Spores* monolete, the laesura $^2/_3$ to $^3/_4$ of the spore length, the perispore irregularly folded, mostly somewhat spinulose, often perforate. *Chromosome number* n=41, 82, 164; 2n=82, 164, 328; apogamous 123, 246.

Key to the African species of *Polystichum* (including Marion and Prince Edward Islands)

1 Lamina 1-pinnate (rarely 1-pinnate-pinnatifid) ..... 1. **P. macleae**

– Lamina 2-pinnate to 3-pinnate 2

2 Rhizome short, erect to suberect, mostly unbranched 3

– Rhizome short-decumbent to widely creeping, mostly branched 10

3 Larger rhizome and stipe base paleae with long uniseriate hairs along the margin and superficially ..... 2. **P. luctuosum**

– Larger rhizome and stipe base paleae without long uniseriate hairs along the margin and superficially 4

4 Lamina with 1–3 paleated proliferous buds along the rachis near the lamina apex 5

– Lamina without proliferous buds along the rachis 6

5 Pinnule margins obtusely serrate to crenate, never aristate ..... 3. **P. volkensii**

– Pinnule auricle and apex aristate ..... 4. **P. kilimanjaricum**

6 Apices of paleae terminating in a short subulate cell or a small thin-walled cell, the margins set with short straight and/or angular outgrowths 7

– Apices of paleae always terminating in an acicular cell, the margins set with long straight and/or long twisted emarginate to forked outgrowths 8

7 Stipe and rachis moderately paleated; paleae mostly flat or irregularly folded ..... 5. **P. aculeatum**

– Stipe and rachis densely paleated; paleae mostly helically twisted ..... 6. **P. setiferum**

8 Conspicuously larger paleae mostly confined to the stipe, rugose ..... 7. **P. transvaalense**

– Conspicuously larger stipe paleae extending to the rachis, never rugose 9

9 Distal pinnae folded ventrally along the rachis (conduplicate); spores not aborted ..... 8. **P. wilsonii**

– Distal pinnae never folded ventrally along the rachis; spores aborted ..... 9. **P. × saltum**

10 Rhizome to 10 mm in diameter; sori exindusiate 11

– Rhizome more than 10 mm in diameter; sori indusiate 12

11 Rhizome to 5 mm in diameter; stipe and rachis paleae with long flagelliform outgrowths along the margin ..... 10. **P. marionense**

– Rhizome to 10 mm in diameter; stipe and rachis paleae with or without thin-walled cells along the margin ..... 11. **P. transkeiense**

12 Lamina with a proliferous bud along the rachis near the apex ..... 12. **P. magnificum**

– Lamina without proliferous buds along the rachis 13

13 Rhizome paleae conspicuously rugose, often with a few long filiform outgrowths along the margin; smaller stipe, rachis and pinna-rachis paleae basally with short and/or long filiform outgrowths along the margin ..... 13. **P. zambesiacum**

– Rhizome paleae not conspicuously rugose, mostly with short straight or curved marginal outgrowths; smaller stipe, rachis and pinna-rachis paleae basally without short and/or long uniseriate outgrowths along the margin 14

14 Proximal acroscopic pinnule to 22 mm long; larger stipe base paleae often bicolorous 15

– Proximal acroscopic pinnule usually more than 22 mm long; larger stipe base paleae never bicolorous 16

15 Rhizome short-decumbent with crowded stipe bases, closely branched; apogamous (32 spores per sporangium) ..... 14. **P. monticola**

– Rhizome decumbent, stoloniferous; sexual (64 spores per sporangium) ..... 15. **P. dracomontanum**

16 Pinnules inaequilaterally ovate to narrowly trullate, to 60 × 13 mm; sporangium stalk glandular or eglandular; indusium with or without unicellular thin-walled cells along the margin ..... 16. **P. incongruum**

– Pinnules inaequilaterally ovate, ovate-oblong, ovate-rhomboid or trullate, to 50 × 19 mm; sporangium stalk and indusium always eglandular ..... 17. **P. pungens**

1. **Polystichum macleae** (Baker) Diels in Engl. & Prantl, *Nat. Pflanzenfam.* **1**(4): 190 (1902), as *macleanii*. Type: South Africa, in convallibus humidis – Drakensbergen prope 'Pilgrim's Rest Gold Fields', *McLea* 34 sub *Bolus* 3030 (K!-lectotype, designated by Schelpe & Anthony (1986); BOL!, SAM!-isolectotypes). Fig. 2.

Aspidium macleae Baker in Hook.f., *Icon. pl.*: t. 1654 (1886), as *macleaii*.

Plants terrestrial, epilithic, or rarely epiphytic. *Rhizome* decumbent, to 200 mm long × 20 mm in diameter, densely set with roots, persistent stipe bases, and paleae; paleae ferrugineous, membranous to chartaceous, narrowly ovate or lanceolate, to 7 × 2 mm. *Fronds* caespitose, to 7 per plant, arcuate, to 1.47 m long: *stipe* proximally castaneous, stramineous distally, adaxially sulcate, to 670 mm long × 8 mm in diameter, proximally densely paleated; larger paleae broadly attached, concolorous or bicolorous, the concolorous paleae ferrugineous, the bicolorous paleae centrally dark brown or black, ovate, narrowly ovate, or narrowly oblong, cordate, entire or with short and/or long marginal outgrowths proximally, the apex flagelliform, terminating in a long filiform cell or an oblong thin-walled cell, to 37 × 8 mm; smaller paleae concolorous, ferrugineous, membranous, narrowly ovate, lanceolate, narrowly triangular, narrowly oblong to acicular, cordate, cordate-imbricate, or short-stalked, proximally erose and/or with long twisted, filiform outgrowths, the

apex flagelliform, terminating in a filiform cell or an oblong thin-walled cell: *lamina* 1-pinnate (rarely 1-pinnate-pinnatifid), oblong to narrowly elliptic, with up to 37 free pinna pairs, to 840 mm long, the proximal pinnae slightly reduced, usually deflexed: *rachis* stramineous, adaxially sulcate, moderately paleated; paleae short-stalked, ferrugineous, membranous to chartaceous, narrowly ovate, narrowly lanceolate, or oblong to subulate, cordate, cordate-imbricate, proximally usually erose and/or with a few short or long twisted marginal outgrowths, the apex long-attenuate to flagelliform, terminating in an acicular cell or an oblong thin-walled cell, to 3 mm long: *pinnae* firmly herbaceous, olive-green adaxially, paler abaxially, generally not overlapping, short-stalked, narrowly oblong-attenuate, straight, auriculate acroscopically, the base unequally broad-cuneate to truncate, doubly serrate, to 168 mm long × 16 mm wide, the acroscopic auricle on proximal pinnae often free, ovate to trullate, to 24 × 22 mm; costa adaxially sulcate, sparsely paleated, the paleae taeniform, sessile or short-stalked, entire, the apex terminating in an acicular cell or an oblong thin-walled cell, to 3 mm long, abaxially moderately to densely paleated, the paleae ferrugineous, membranous, narrowly lanceolate to narrowly trullate, often bullate, cordate to cordate-imbricate, the margin proximally with short and/or long irregular outgrowths, entire distally, the apex terminating in an acicular cell or an oblong thin-walled cell, to 2.4 mm long. *Venation* raised. *Sori* circular, to 1.5 mm in diameter, variable in size, those closest to the costa largest, discrete at maturity, medial to inframedial on unabbreviated vein branches: *sporangium* with 12–(16)–28 indurated annulus cells; stalk eglandular: *indusium* brown, persistent, peltate, circular to irregular, repand to erose, often with flabellate central processes, the maximum radius 0.29–(0.49)–0.7 mm. *Spores* 64 per sporangium, brown, the perispore folded to form a sparse reticulum of low compressed ridges, variously granulate, verruculate to echinulate, closely perforated, the exospore 40–(51.31)–66 × 28–(37.89)–48 µm. *Chromosome number* 2n=164.

MATERIAL EXAMINED

SOUTH AFRICA. 2330 (Tzaneen): Tzaneen, Woodbush Forest Reserve (CC), *Balsinhas* 2166 (PRE); Wolkberg, Agatha Forest Reserve, 1500 m, *Muller* 264 (PRE); Woodbush, *Van Jaarsveld* 6110 (BOL). **2430 (Pilgrim's Rest)**: Haffenden Heights, Zoutpansberg (AA), *Junod* 4069 (P, PRE); Mariepskop (DB), *Van der Schijf* 4305, (B, NU, PRE), 5597 (PRE); Mariepskop summit, 1800 m, *Van der Schijf* 4861 (PRE); Mariepskop, below radar station, *Krynauw* 786 (PRE); Graskop, Erasmus Kop, *Hardcastle* 59 (PRE); Mariepskop, *Schweickerdt* 4305 (BOL); Ohrigstad Nature Reserve, 6000 ft (DC), *Jacobsen* 1556 (PRE); Pilgrim's Rest, Mount Sheba Nature Reserve, *Roux* 2555 (NBG); Mount Sheba Nature Reserve, *Jacobsen* 4436 (PRE); Mount Sheba Nature Reserve, *Crouch* 633 (NU); Graskop, Cigar Rock (DD), *Rauh & Schlieben* 9744 (PRE); Graskop, Kowyn's Pass, *Rauh & Schlieben* 9725 (PRE); Graskop, Driekop Gorge, *Wager* 173 (PRE); Pilgrim's Rest, *Rogers* 14925, 14927 (PRE); Blyde Bosboustasie, *Bredenkamp* s.n. (PRE); Pilgrim's Rest, *MacLea* 170 (PRE); Kowyn's Pass, *Schelpe* 1641 (BOL, NH, NU), 6092 (BOL); Graskop, Fairyland, *Roux* 2548, 2549 (NBG); Graskop, The Pinnacle, 4500 ft, *Braithwaite* 207 (BOL). **2530 (Lydenburg)**: Lydenburg, Hartbeesvlakte (BA), *Kluge* 2039, 2333 (PRE); Lydenburg, Hartbeesvlakte, 1960 m, *Mohle* 288 (PRE); Pilgrim's Rest, Mount Anderson, *Smuts* 38 (PRE); Sabie, forest at Tweefontein (BB), *Wager* 53 (PRE); Sabie/Lydenburg road, *Roux* 2242, 2561 (NBG); Witklip Staatsbos (BD), *Kluge* 806 (PRE); Belfast (CA), *Wager* s.n. (PRE); Kaapse Hoop (DB), *Van Jaarsveld* 2088*a* (NBG, PRE), 3376 (BOL); Kaapse Hoop, *Wager* 73 (BOL), 1496*c* (PRE). **2531 (Komatipoort)**: Barberton, Tiger Creek, 4500 ft (CC), *Thorncroft* 96 (BR, P, Herb. PIC.SERM., PRE); Barberton, Maid of the Mist, *Thorncroft* 50 (P, PRE), 68 (NBG, P, PRE); 17 miles SE of Barberton towards Havelock, 5000 ft, *Schelpe* 4115 (BOL, PRE); W. of Havelock, Songimvelo Game Reserve, on farm Josefsdal, 1640 m, *Kunitz & Otto* 15 (J, PRE).

SWAZILAND. 2531 (Komatipoort): New Havelock, 12 miles from Havelock (CC), *Schütte* 4 (BOL); Havelock Mine, *Dyer* 57 (NU). **2632 (Bela Vista)**: Mbabane, Ngwenya Mountain (AA), *Compton* 31405 (NBG)

WITHOUT EXACT LOCALITY: loco incerto, *Bolus* s.n. (PRE); South Africa, *Wood* s.n. (NU).

The change of the specific epithet *macleaii* to *macleae* is in concordance with Article 60.11 (Recommendation 60C.1.a) of the International Code of Botanical Nomenclature (Greuter et al., 1994).

DIAGNOSTIC FEATURES AND RELATIONSHIPS. *Polystichum macleae* is the only 1-pinnate (rarely 1-pinnate-pinnatifid) species in Africa and is quite similar to *P. kalambatitrense* Tardieu from Madagascar. Baker (1886) considered *P. macleae* to be related to *P. munitum* (Kaulf.) C. Presl from North America and *P. falcinellum* (Sw.) C. Presl from Madeira. This assumption was probably based on the 1-pinnate lamina morphology in these taxa. Both these species, however, have ciliated indusia. Also, the palea morphology of both these species differs from that in *P. macleae*. In *P. macleae* the marginal outgrowths of the lamina paleae are pluricellular whilst those of *P. munitum* and *P. falcinellum* are unicellular.

VARIATION. *Polystichum macleae* shows considerable variation in the number of indurated annulus cells per sporangium and in indusium and pinna morphology. The number of indurated annulus cells per sporangium ranges from 12 to 28. The mean number of indurated annulus cells per sporangium is 16.67 (n=650, SD=0.14) taken from 13 populations throughout the species' distribution. Some populations have a larger number of indurated annulus cells than others. Although no definite correlation could be made between habitat and the number of indurated annulus cells, plants collected from an exposed streambank on the Hartbeesvlakte near Lydenburg [*Kluge* 2039 (PRE)] have a number of indurated annulus cells that ranges from 19 to 28 (x=23.86, SD=1.91, n=50), which is significantly higher than for a plant growing in a forest habitat [*Thorncroft* 68 (NBG)], where the number of cells ranges between 12 and 16 (x=13.28, SD=0.75, n=50). Intermediates between these extremes do occur. Indusia are mostly simple, but on some plants they may bear one or more small wings, whilst on others they may bear numerous flabellate central processes. The margins vary from repand to erose.

A 1-pinnate-pinnatifid form of *Polystichum macleae* has been recorded from Mpumalanga with the central pinnae bearing up to 11 nearly free pinnule pairs. Pinnules are inaequilaterally narrowly trullate to oblong-attenuate in outline with the margins obtusely serrate. In the distal pinnae the margins are merely lobed midway to the costa. Sori are uniseriate on either side of the costa and are borne inframedially.

The size of the acroscopic auricle varies considerably, and on the proximal pinnae it is often detached from the rest of the pinna. The auricle sometimes overlaps with the pinna directly above. Pinna margins are generally obtusely serrated or doubly serrated but rarely the margins are also deeply lobed and serrated.

DISTRIBUTION AND ECOLOGY. *Polystichum macleae* is confined to the Drakensberg Escarpment and Wolkberg in the Mpumalanga province of South Africa and the northern parts of Swaziland, occurring at elevations ranging between 1350 and 1960 m. The species is largely confined to forests where it grows on banks above streams, in forest margins, among rocks and often as a low-level epiphyte. Plants often form large stands in deep shade, but rarely also occur in exposed habitats.

2. **Polystichum luctuosum** (Kunze) T. Moore, *Ind. fil.*: 95 (1858).
Type as for *Aspidium luctuosum* Kunze.
Fig. 3.

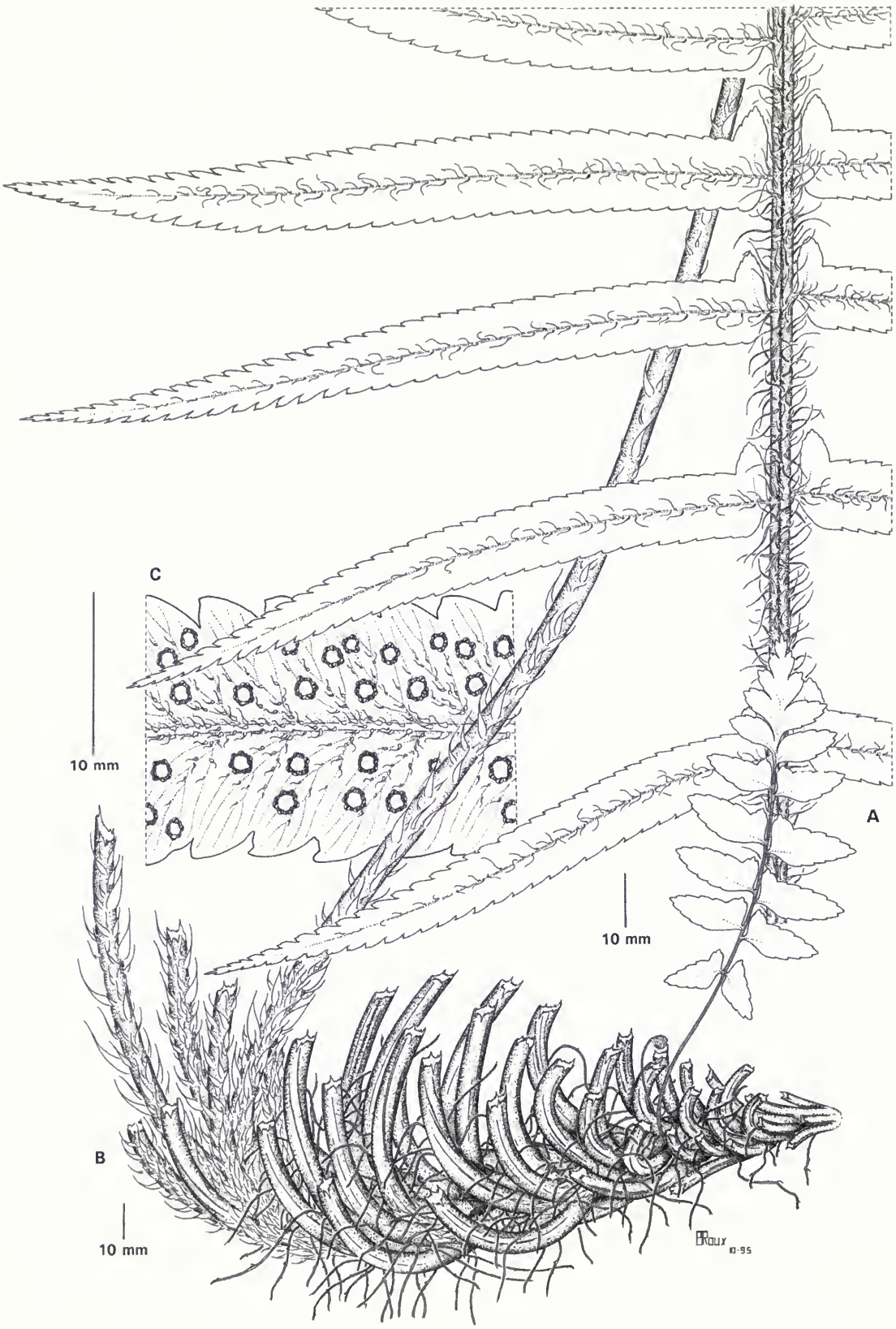

Fig. 2 *Polystichum macleae*. A, proximal part of lamina; B, rhizome; C, section of abaxial surface of fertile pinna. A & B, drawn from *Roux* 2548 (NBG); C, drawn from *Roux* 2242 (NBG).

Aspidium luctuosum Kunze in *Linnaea* **10**: 548 (1836). Type: In monte Katriviersberg in sylvis, *Ecklon* s.n. (LZ†-syntype); ad fontes fl. Katrivier prope Philipstown, in sylvis montium, *Ecklon* s.n. (LZ†-syntype).

Aspidium tsus-simense Hook., *Sp. fil.* **4**: 16, t. 220 (1862). Type: Island of Tsus Sima, in the Straits of Korea, *Wilford* s.n. (K-holotype, 2 sheets; NBG!-photograph).

Polystichum tsus-simense (Hook.) J. Sm., *Hist. fil.*: 219 (1875).

Polystichum lobatum var. *luctuosum* (Kunze) H. Christ in *Ber. Schweiz. Bot. Ges.* **3**: 34 (1893).

Plants terrestrial, epilithic, or rarely low-level epiphytes. *Rhizome* short, erect to suberect, to 10 mm in diameter, densely set with roots, persistent stipe bases, and paleae; larger paleae broadly attached, castaneous, chartaceous, ovate, narrowly ovate, or lanceolate, cordate, with long twisted uniseriate, gland-tipped hairs on the apical margin and surface, the apex flagelliform, terminating in an oblong thin-walled cell, to 10.5 × 3.3 mm; smaller paleae short-stalked, narrowly triangular to subulate, cordate, the margins proximally with numerous long and twisted uniseriate hairs, distally with widely spaced apically and basally directed marginal outgrowths that become smaller apically, the apex flagelliform, terminating in a small thin-walled cell. *Fronds* crowded, caespitose, 7–16 per plant, suberect to arching, to 0.93 m long: *stipe* proximally castaneous, stramineous distally, adaxially sulcate, to 450 mm long × 5 mm in diameter, densely paleated; proximal paleae broadly attached, castaneous, chartaceous, ovate, cordate, proximally entire or with a few short and/or long uniseriate hairs, distally with numerous multicellular hairs as for rhizome paleae; distal paleae short-stalked, narrowly oblong, narrowly triangular or subulate, cordate to hastate, the margins bearing a few long and/or short multicellular hairs proximally, distally with widely and irregularly spaced outgrowths reduced in size and number towards apex, the apex flagelliform, terminating in a small thin-walled cell, to 15 × 1.5 mm: *lamina* 2-pinnate to 2-pinnate-pinnatifid, with up to 25 free pinna pairs, to 480 mm long, firmly herbaceous to coriaceous, olive-green adaxially, paler abaxially, narrowly ovate to ovate, the proximal pinnae slightly reduced, often somewhat deflexed: *rachis* stramineous, adaxially sulcate, densely paleated; paleae short-stalked, dark brown to black, glossy, chartaceous to crustaceous, narrowly triangular to subulate, cordate to hastate, the auricles usually bearing long and twisted multicellular and uniseriate hairs some of which terminate in a thin-walled cell, the margins either distally with short, widely and irregularly spaced outgrowths that reduce in size and number towards the apex, or more or less entire in smaller paleae, to 7 mm long: *pinnae* short-stalked, 1-pinnate to 1-pinnate-pinnatifid, with up to 12 free pinnule pairs, narrowly lanceolate, proximally widely spaced, distally often somewhat overlapping, to 173 mm long: *pinna-rachis* stramineous, adaxially sulcate, densely set with paleae similar to but less complex than those on the rachis: *pinnules* widely spaced to overlapping, the proximal acroscopic pinnule the largest, often significantly longer than the next, up to 40 mm long and 12 mm wide, inaequilateral, narrowly trullate to rhomboid, basiscopically cuneate, acroscopically truncate and auricled, often somewhat falcate, lobate-serrate, aristate; proximal pinnules short-stalked, often acroscopically incised to or nearly to the costa; costa adaxially sulcate, glabrous, abaxially sparsely paleated, the paleae castaneous, chartaceous, narrowly triangular-hastate to subulate-hastate, cordate to cordate-imbricate, proximally with long and/or short filiform outgrowths often terminating in a thin-walled cell, the apex always terminating in a small thin-walled cell, to 0.3 mm long. *Venation* immersed. *Sori* circular, *c.* 1.2 mm in diameter, terminal or nearly terminal on abbreviated vein branches, essentially uniseriate: *sporangium* with 10–(13)–19 indurated annulus cells; stalk eglandular: *indusium* peltate, circular, entire, repand or crenulate, persistent, brown, pale brown and often dark centred before drying, cupulate when dry, the maximum radius 0.5–(0.73)–0.95 mm. *Spores* 32 per sporangium, brown, the perispore unevenly folded to form narrow and broad reticulate ridges, the ridges and areas between ridges echinulate, spiculate or verruculate, the exospore 30–(38.84)–50 × 22–(28.2)–36 µm. *Chromosome number* 2n=123, apogamous.

MATERIAL EXAMINED

LESOTHO. 2828 (Bethlehem): Leribe (CC), *Phillips* s.n. (SAM). **2927 (Maseru)**: Roma Valley (BC), *Schmitz* 6963 (PRE); Roma, *Ruch* 1909 A-only (PRE).

SOUTH AFRICA. 2430 (Pilgrim's Rest): The Downs (AA), *Junod* s.n. & 4044 (BR, P, PRE); Mt Sheba (DC), *Kluge* 2320 (NBG, PRE); Blyde Forest Reserve (DD), *Jacobsen* 4365, 4376 (PRE); Driekop Gorge, Graskop, *Wager* 178 (PRE); Pilgrim's Rest, Ponies Krantz, *Braithwaite* 229 (BOL); Sabie, just outside Ceylon Forest Reserve, *Braithwaite* 135 (BOL). **2530 (Lydenburg)**: Lydenburg District, Spitzkop, *Wilms* 1781 (B, BM); Sabie Gorge (BB), *Wager* s.n. (PRE); Lone Creek Falls, Sabie, *Burrows* 1342 (BOL); Sabie, *Rogers* 20379 (PRE); Sudwala Caves, 1500 m (BC), *Kluge* 2463 (NBG, PRE); Lydenburg, Buffelskloof Nature Reserve, *Burrows* 3860 (GRA); between Machadodorp and Badplaas (CD), *Steel* 242 (PRE). **2531 (Komatipoort)**: Rimers Creek, Barberton (CC), *Thorncroft* 35 (P); Baberton, *Pott-Leendertz* 5574 (PRE); Lomati Falls behind Barberton, *Wager* 154 (PRE); Barberton, *Thorncroft* 36, 104c (PRE); creeks near Barberton, *Thorncroft* 2475 (L). **2729 (Volksrust)**: Newcastle, Nkandu Reserve, 4900 ft (DD), *Smith* 64 (NU). **2730 (Vryburg)**: road to Lüneburg (AD), *Roux* 2268 (NBG); Pongola Bush Nature Reserve, 1500 m (BC), *Glen* 2390 (PRE); Utrecht, Donkerhoek, 5500 ft, *Devenish* 1144 (PRE); Hlobane, Mtola Forest, *Johnstone* 296 (NU). **2828 (Bethlehem)**: Farm Boschkloof (DB), *Roux* 1228 (NBG); Witsieshoek, *Junod* s.n. (P); Royal Natal National Park, *Okell* 60 (NU). **2829 (Harrismith)**: Van Reenen, 5000 ft (AD), *Schlechter* 6718 (B, BM, GRA, PRE, SAM); Van Reenens Pass, *Rehmann* 7204 (P); Van Reenen, 5000 ft, *Lidey* 42 (NU); Robinson's Bush, Oliviershoek Pass (CA), *Schelpe* 7967 (BOL); near Cathedral Peak, *Box* 3371 (BM). **2929 (Underberg)**: Giants Castle Nature Reserve (AB), *Roux* 2503 (NBG); Injasuti Nature Reserve, below Cataract Valley, *Roux* 2718 (NBG); Champagne Castle, *Bayer* 1444 (NU); Cathedral Peak, bank of Kweliquala River, 4700 ft, *Schelpe* P4 (NU); Cathedral Peak, 5700 ft, *Killick* 1155 (NU, PRE); Cathedral Peak, Rainbow Gorge, 5500 ft, *Cowan* 96 (NU); Cathedral Peak, 1550 m, *Goetghebeur* 4552 (BR, PRE); Cathedral Peak, *c.* 5000 ft, *MacGregor* 43 (NU); Cathkin Park, *Howlett* 53 (NH); Estcourt, Nolema Forest, 4200 ft, *Edwards* 2685 (NU, PRE); Cathkin Peak, Ndema Forest, 4400 ft, *Hillary* 106 & 107 (NU); Cathkin Park, *Howlett* 53 (NH); Injasuti area, 5000 ft, *Esterhuysen* 26034 (BOL, NBG, PRE); above Dalton Bridge, above Bushmans River, *c.* 4500 ft, *Wright* et al. 27 (NH, PRE); Mooi River, The Hoek, 4700 ft (BC), *Bourquin* 320 (NU); Polela District, Ndumduma, Glengariff (CB), *Rennie* 913, 940 (NU); Cobham Forest Station, Whale Rock, *Hill* 48 (GRA); Bulwer Mountain (DB), *Van Jaarsveld* 6468 (NBG, PRE); Bulwer (DD), *Clarkson* 177 (NH, NU); Bulwer, Sunset, 5200 ft, *Rennie* 546 (NU); Bulwer, *Allsopp* 839 (NU); near Bulwer, *Schelpe* P52 (NU). **2930 (Pietermaritzburg)**: Balgowan, farm Boschfontein, 4000 ft (AC), *Fisher* 638 (NH, NU), 642 (NH, NU); Lions River District, Dargle, *Smook* 624 (NU); Balgowan, *Thomas* 71 (NU); Balgowan, *Devlin* 62 (NU); Balgowan, 4000 ft, *Lindahl* 107 (NU); Balgowan District, *Thienel* 109 (NU); Balgowan, 3500 ft, *Bernele* 113 (NU); Balgowan, 3500 ft, *Crookes* 105 (NU); Nottingham Road, *McClean* 899 (NH, PRE); Nottingham Road, *sine coll.* NH-26790 (NH); Dargle, Griffin's Farm, 1500 m, *Jones* 20 (NH); Lions River, Dargle, *Esterhuysen* 26202 (BOL); Balgowan, Bosch Hoek, 1400 m, *Moll* 905 (BOL, NU, PRE); Lions River, Lions Bush Forest, *Moll* 829 (BOL, NU); Pietermaritzburg (CB), *Tyson* s.n. (PRE); Pietermaritzburg, *c.* 2200 ft, *Carnegie* 692 (NU); Pietermaritzburg, Blackridge, *F.G.C.* 692 (NU); Inanda, *Wood* s.n. (B). **3029 (Kokstad)**: Langewacht Forest Reserve near Kokstad, *c.* 1200 m (CB), *De Joncheere* s.n. (PRE); Mt Currie, Kokstad, *Stephany* 505 (BOL); Glen Hope, *Jacottet & Jacottet* 539 (BM). **3126 (Queenstown)**: Woodvale Forest, Gwatyn, 4200 ft (AA), *Galpin* 8203 (PRE). **3127 (Lady Frere)**: Engcobo (DB); *McLoughlin* 1022 (PRE); Engcobo, *Flanagan* 2781 (PRE). **3128 (Umtata)**: Maclear, farm Woodcliffs (AB), *Roux* 2479 (NBG); Engcobo,

Fig. 3 *Polystichum luctuosum*. A, proximal part of lamina; B, rhizome; C, abaxial surface of fertile pinnule. All drawn from *Roux* 2433 (NBG).

Ku-Hlophekazi Forest (AC), *Cawe* 777 (BOL); Tsolo, Gxalibomvu Forest (AD), *Cawe* 660 (BOL); Tsolo, Bele Forest (BC), *Cawe* 731 (BOL); Nqadu Forest, *Hutchings* 39 (BOL); Mount Baziya, *Baur* 644 (B). **3225 (Somerset East)**: in sylvis ad pedem montis Boschberg (DA), *Barkley* s.n. (GRA, P, SAM); in sylvis ad pedem montis Boschberg, *MacOwan* 1884 (B, BOL); Boschberg, *Bolus* 95 (BOL). **3226 (Fort Beaufort)**: Katberg Forest (BC), *Holland* s.n. (NBG); Katberg, *Hutton* s.n. (B, L); Katberg Forests, *c.* 3000 ft, *Adams* 142 (NU); Hogsback, Madonna and Child Falls (DB); *Greathead* s.n. (SRGH); Hogsback Forest, Auckland Kloof, *Griffen* x46 (PRE); Brambledene, Menziesberg, *Acocks* 11112 (PRE); Hogsback, *Gibbs-Russel* 3832 (PRE). **3227 (Stutterheim)**: Isidinge Forest (CA), *Roux* 1986 (NBG); Keiskamma Hoek, Gxulu Mountain, 5500 ft, *Story* 3509 (PRE); Kalogha Forest Station (CB), *Roux* 2433 (NBG); Pirie Forest, along Amatola trail, *Roux* 2709 (NBG); Pirie Forest, *Flanagan* 1758 (PRE); Fort Cunningham, *Roux* 2427 (NBG); Pirie (CC), *sine coll.* s.n. (GRA); Amabele (DA), *sine coll.* s.n. (PRE); Pirie, *Sim* s.n. 505, 1727c (GRA, PRE); Komgha (DB), *Flanagan* s.n. (SAM).

SWAZILAND. 2631 (Mbabane): Gobolo, *c.* 3500 ft (AC), *Dlamini* s.n. (NBG, NH, PRE); Stroma, *c.* 4000 ft, *Compton* 25822 (NBG, PRE).

ZIMBABWE: Inyanga, Nyangani, 6000 ft, *Chase* 3813 (NU, SRGH); Gweni, Mt. Cashel, *Chase* 1083 (SRGH).

WITHOUT EXACT LOCALITY: Gold Fields, *Ayres* s.n. (NH); Cap de Bonne Esperance, *Drége* s.n. (P); Johannesburg, *Westeman* s.n. (P); Cap b. Spei, *Ecklon* s.n. (P); Natal, *sine coll.* s.n. (P); Mor Bridge, *Hill* 692 (PRE); Drakensberg, *Bottomley* s.n. (PRE); Natal, *Buchanan* s.n. (BOL, M); O.F.S. TM1761c (PRE); Natal, *Wood* 504 (PRE); in vollbus montium seciis Katrivier, prope Philipstown, 3000–4000 ft, *Ecklon & Zeyher* s.n. (P); Natal, *Buchanan* 27 A-only (M); Kaffrarian forests, *Sim* s.n. (B); Natalia, *Buchanan* 74, 84 (B); Cap./Pr. b. sp., *Ecklon & Zeyher* 38.6 (B); ceded territory, Quellen des Katrivier, 3000–4000 ft, *Drége* s.n. (B); Prom. b. Spei, *Drége* s.n. B & C only (B); Natal, *Wood* s.n. (NU); Xumeri Forest, *Rycroft* 518 (NU); loco incerto, *sine coll.* s.n. NH-9785 (NH); below Mwndali, 5000 ft, *Anderson* s.n. (BM); Himalaya, Ravi Valey, Chanjú, 7000 ft, *McDonnell* 34 (BM); South Africa, *Barckley* 95 (GRA); *sine coll.* s.n. (L); loco incerto, *sine coll.* s.n. NH-26468 (NH).

The African *Polystichum luctuosum* (Kunze) T. Moore and the Asian *P. tsus-simense* (Hook.) J. Sm. have been considered either as distinct taxa (Mitui, 1965, 1968; Hirabayashi, 1969; Daigobo, 1973; Nakaike, 1975; Gibby, 1985; Punetha et al., 1988) or as synonymous (Hope, 1902; Hooker in Hooker & Baker, 1868). Plants occurring in the western Indo-Himalayan mountains have been ascribed to either *P. tsus-simense* (Dixit, 1983) or to *P. luctuosum* (Khullar, 1987; Punetha et al., 1988). Fraser-Jenkins (in Gibby, 1985) considers the two taxa as vicariants. I have studied material throughout the distribution range of these taxa and find them to be conspecific.

DIAGNOSTIC FEATURES AND RELATIONSHIPS. Diagnostic of *Polystichum luctuosum* is the olive-green colour of the adaxial surface of the lamina and the darker veins seen in living plants. It is also separated from other taxa in the region by the usually very dark and narrow paleae occurring along the stipe and rachis. The larger rhizome and stipe base paleae bear long filiform outgrowths along the margin and palea surface. Indusia are large, persistent and entire, and take on a cupulate form when mature. *Polystichum luctuosum* is furthermore a triploid apomict with 32 spores per sporangium and has a somatic chromosome number of 2n=123.

Within the study area *Polystichum luctuosum* is the only member belonging to section *Xiphopolystichum* Daigobo.

VARIATION. *Polystichum luctuosum* shows little variation in stipe, lamina and basal pinna length within the study area. A comparison of these parts with Asian material shows that African (including Madagascar) plants are slightly larger than the plants from Asia. Guard-cell length in African material shows little variation, but in Asian plants the variation is pronounced. Asian plants also have larger guard cells than African plants. Sori may be uniseriate or biseriate, variation that appears to be environmentally induced. Indusia show a large degree of variation in both African and Asian plants, with African plants having larger indusia than Asian plants. Also the number of indurated annulus cells per sporangium shows some variation. In African plants the number ranges from 10 to 19, whereas in Asian plants the number ranges between 10 and 21. Spores too show variation, with Asian plants having larger spores than African plants (Table 1). Although variations in palea colour occur, their morphology remains fairly stable throughout the distribution of the species.

DISTRIBUTION AND ECOLOGY. In South Africa *Polystichum luctuosum* occurs from the Eastern Cape through KwaZulu-Natal to the northeastern parts of the Free State, Mpumalanga, and the Northern Province. It also extends to the lower elevations in the western parts of Lesotho, the higher-lying part of Swaziland, and with isolated populations occurring along the eastern escarpment in Zimbabwe. Outside of Africa the species occurs on Réunion and the central parts of Madagascar, extending to the Indian subcontinent, Pakistan, China, Vietnam, South Korea and Japan (Honsyu, Sikoku and Kyusyu).

Polystichum luctuosum occurs in the eastern parts of the summer rainfall regions of southern Africa where it appears to be restricted to the drier forest types such as Dohne Sourveld in the Eastern Cape, Highland Sourveld along the Drakensberg foothills, 'Ngongoni Veld in the KwaZulu-Natal midlands and Northeastern Mountain Sourveld in Swaziland, and along the lowveld escarpment and Soutpansberg. In South Africa *P. luctuosum* occurs at elevations ranging from 670 m to 1740 m, whereas in Zimbabwe on Mount Nyangani it occurs at elevations as high as 1825 m.

Polystichum luctuosum mostly grows on rocks along streams, but often also as a low-level epiphyte in moist forests. Plants often also grow on rocks away from water and in fairly dry conditions.

3. **Polystichum volkensii** (Hieron.) C. Chr., *Index filic.*: 97 (1905).
Type as for *Aspidium volkensii* Hieron.
Fig. 4.

Aspidium volkensii Hieron. in H.G.A. Engler, *Pflanzenw. Ost-Afrikas*: 86 (1895). Type: Tanzania, an der oberen Grenze des Waldes über Kiboscho, 3000 m, *Volkens* 1520 (B!-holotype).

Polystichum barbatum C. Chr. in *Notizbl. Bot. Gart. Berlin-Dahlem* **9**: 178 (1924). Type: Kenya, Mt. Aberdare, pr. Kinangop, regio *Hagenia abyssinica*, *c.* 3300 m, *Rob. E. & Th. C.E. Fries* 2735 (K!-holotype; B!-isotype).

Plants terrestrial. *Rhizome* short, erect, to 10 mm in diameter, densely set with roots, persistent stipe bases, and paleae; paleae sessile or short-stalked, ferrugineous, chartaceous, narrowly lanceolate, cordate, entire, the apex terminating in an acicular cell, to 15 mm long. *Fronds* caespitose, to 14 per plant, erect, to 1.2 m long: *stipe* proximally castaneous, stramineous distally, adaxially sulcate, to 520 mm long × 10 mm in diameter, densely paleated; larger paleae short-stalked, ferrugineous, membranous, translucent, shrivelled, elliptic to ovate, cordate to cordate-imbricate, minutely fimbriate, the apex long, shrivelled, filiform, entire, terminating in an acicular cell, to 34 × 10 mm; smaller paleae short-stalked, convolute, ovate to narrowly ovate, cordate to cordate-imbricate, proximally with short straight or angular marginal outgrowths, becoming entire towards the apex, the apex subulate, terminating in an acicular cell: *lamina* 3-pinnate, herbaceous, narrowly elliptic, to 925 mm long, olive-green adaxially, slightly paler abaxially, with a single paleated proliferous bud on the rachis near the lamina apex, the proximal pinnae decrescent, often somewhat deflexed: *rachis* stramineous, adaxially sulcate, densely paleated; paleae short-stalked, convolute,

Table 1 Variation in metric characters for African and Asian *Polystichum luctuosum* (Kunze) T. Moore.

Character	African			Asian		
	x	Range	n	x	Range	n
Stipe length	197 mm	90–450 mm	35	193 mm	98–450 mm	21
Lamina length	271 mm	158–448 mm	46	235 mm	162–465 mm	29
Basal pinna length	66.8 mm	31–178 mm	46	51.8 mm	30–98 mm	21
Guard cell length	41.16 µm	30–52 µm	580	46.9 µm	36–60 µm	760
Indusium size	0.73 mm	0.56–0.95 mm	90	0.58 mm	0.31–0.80 mm	115
Number of indurated annulus cells	13.52	10–19	600	14.44	10–21	537
Spore length	38.84 µm	30–50 µm	275	40.75 µm	30–52 µm	405
Spore width	28.2 µm	22–36 µm	275	28.83 µm	22–40 µm	680

stramineous to ferrugineous, narrowly ovate, narrowly lanceolate, or transversely elliptic, cordate to cordate-imbricate, proximally erose or with short straight or angular outgrowths, becoming entire towards the apex, the apex subulate, terminating in an acicular cell, the smaller paleae to 18 × 6 mm: *pinnae* generally not overlapping at the lamina base, overlapping towards middle of the lamina, oblong-attenuate, somewhat falcate, basal pinnae to 54 mm long, the middle pinnae to 190 × 40 mm, proximal acroscopic pinnule slightly enlarged; *pinna-rachis* stramineous, adaxially sulcate, densely paleated; paleae similar to but smaller than those on the rachis: *pinnules* opposite to alternate, asymmetric, acroscopically auriculate, ovate, to 23 × 11 mm, deeply lobed, the acroscopic auricle ovate, cuneate, lobes oblong to narrowly oblong, serrate to crenate, adaxially moderately paleated; paleae castaneous to ferrugineous, chartaceous, convolute, filiform, to 15 mm long, abaxially moderately to densely paleated; paleae short-stalked, castaneous to ferrugineous, chartaceous, convolute, filiform, narrowly linear or subulate, cordate to cordate-imbricate, proximally with short angular outgrowths, entire towards apex, the apex terminating in an acicular cell, to 16.5 mm long. *Venation* immersed. *Sori* circular, <1 mm in diameter, essentially uniseriate, discrete at maturity, terminal or near-terminal on abbreviated vein branches, or dorsally on unabbreviated vein branches: *sporangium* with 12–(14)–19 indurated annulus cells; stalk eglandular: *indusium* ferrugineous to castaneous, peltate, circular, elliptic or irregular, coarsely erose, the maximum radius 0.48–(0.66)–0.92 mm. *Spores* 64 per sporangium, brown, the perispore folded to form a close reticulum of compressed ridges, the ridges and areas between granulate, verruculate or echinulate, variously perforated, the exospore 34–(42.64)–52 × 24–(30.32)–38 µm. *Chromosome number* unknown.

MATERIAL EXAMINED.

KENYA: Mt. Nyandarua, forest belt, 10800–11000 ft, *Rabb & Nightingale* 7 (K).

TANZANIA: Kilimanjaro, highest forest above Kibosho, *Uhlig* 186 (B), *Uhlig* 242 (B, K); Kilimanjaro, cave above Moschi, *Uhlig* 76 (B, K); Kilimanjaro, forested area just below 1st hut and also above Machame route, 1820 m, *Schippers* T1452 (WAG); Kilimanjaro, Machame route, 3450 m, *Pócs* s.n. (WAG); Kilimanjaro, B-only, *Brenner* s.n. (P); Kilimanjaro, S. slope along the Mweka route, near Mweka base hut, 2850 m, *Pócs* 6718/A (K).

WITHOUT EXACT LOCALITY: loco incerto, *sine coll.* BOL-5726 (BOL).

DIAGNOSTIC FEATURES AND RELATIONSHIPS. *Polystichum volkensii* is unique among African *Polystichum* species in the narrowly elliptic lamina outline and the long-decrescent, deflexed or arcuate pinnae. The densely paleated stipe and rachis, and the single proliferous bud borne near the frond apex are also characteristic. The finely divided pinnules and the morphology of especially the smaller paleae ensure that it cannot be mistaken for any other species in the region.

The affinity of *Polystichum volkensii* is yet to be determined.

VARIATION. *Polystichum volkensii* shows little infraspecific morphological variation. Variation is largely restricted to pinnule size and pinna orientation and this may be ascribed to environmental influences.

DISTRIBUTION AND ECOLOGY. *Polystichum volkensii* appears to be confined to Mount Kilimanjaro in Tanzania and the Aberdare Mountain Range in Kenya. At lower elevations (1820 m) on Mount Kilimanjaro it occurs in Undifferentiated Afromontane forests but higher up, at 3450 m, it occurs in the Ericaceous belt with *Erica arborea* and *Podocarpus milanjianus*. On the Aberdare Mountain Range the species occurs in Undifferentiated Afromontane forests but also in Single-dominant Afromontane forests such as *Hagenia abyssinica*-forests at elevations ranging between 3300 and 3610 m (White, 1983).

4. **Polystichum kilimanjaricum** Pic.Serm. in *Webbia* **27**: 445 (1972). Type: Tanzania, Kilimanjaro, presso la Bismarck's Hut, terrestre, nel sottobosco rado nella parte piú alta della foresta umida montana a *Podocarpus milanjianus*, *Hagenia abyssinica* ed *Ilex mitis*, *c.* 2850 m, 8 July 1956, *Pichi Sermolli* 5171 (Herb. PIC.SERM. 20640-holotype; Herb. PIC.SERM. 25150!, K!-isotypes).

Fig. 5.

Plants terrestrial. *Rhizome* erect to suberect, to 180 mm long, closely set with roots, persistent stipe bases, and paleae. *Fronds* 8–12 per plant, caespitose, suberect to arching, to 1.05 m long: *stipe* proximally castaneous, stramineous distally, adaxially sulcate, to 430 mm long × 8 mm in diameter, proximally densely paleated; proximal paleae broadly attached, ferrugineous, crustaceous, narrowly triangular, truncate to cuneate, the margins irregularly set with large recurved outgrowths, the apex terminating in an acicular cell, to 9 × 0.8 mm; distal paleae of two types, the larger broadly attached, bicolorous, with a central ebeneous to castaneous, glossy, crustaceous band, and a dull brown, chartaceous margin, narrowly ovate to broadly ovate, truncate to cuneate, the margins minutely fimbriate, the fimbriae straight or twisted, simple or apically forked, the apex terminating in an acicular cell, to 18 × 7 mm, the smaller short-stalked, concolorous, ferrugineous to stramineous, chartaceous, narrowly ovate to subulate, the margins minutely fimbriate, the subulate paleae always with long and/or short, simple or branched, often apically forked fimbriae at the base and widely spaced, recurved or apically directed outgrowths distally, the apex terminating in an acicular cell: *lamina* 2-pinnate, with up to 35 free pinna pairs, triangular to ovate, to 685 mm long, with 1–3 often widely spaced proliferous buds in pinna axils near the apex: *rachis* stramineous, adaxially sulcate, moderately to densely set with paleae similar to but smaller and paler than those on the stipe: *pinnae* 1-

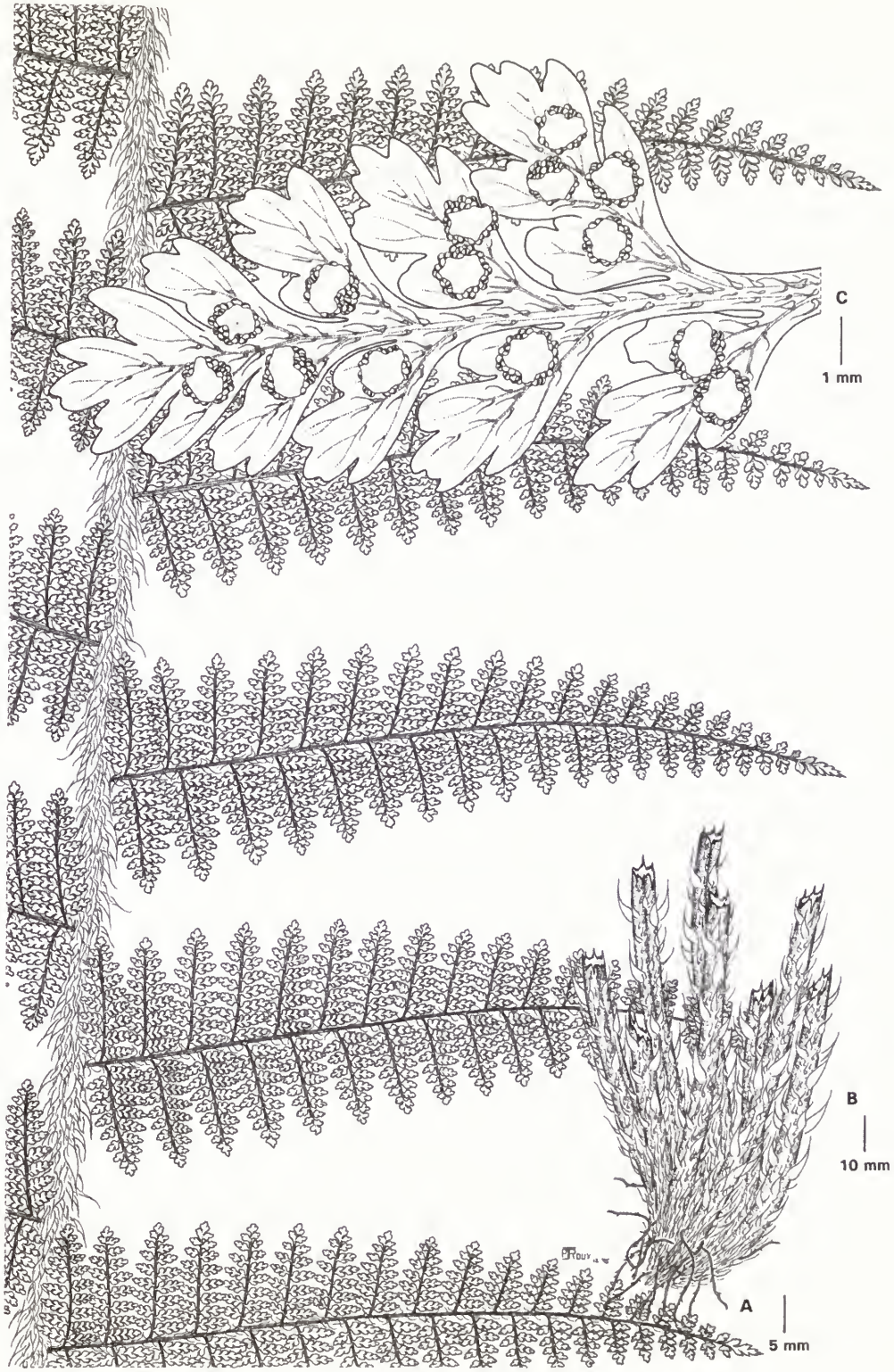

Fig. 4 *Polystichum volkensii*. A, middle pinnae of lamina; B, rhizome; C, abaxial surface of fertile pinnule. A, drawn from *Volkens* 1520 (B); B, drawn from *Radd & Nightingale* 7 (K); C, drawn from *Pócs* s.n. (WAG).

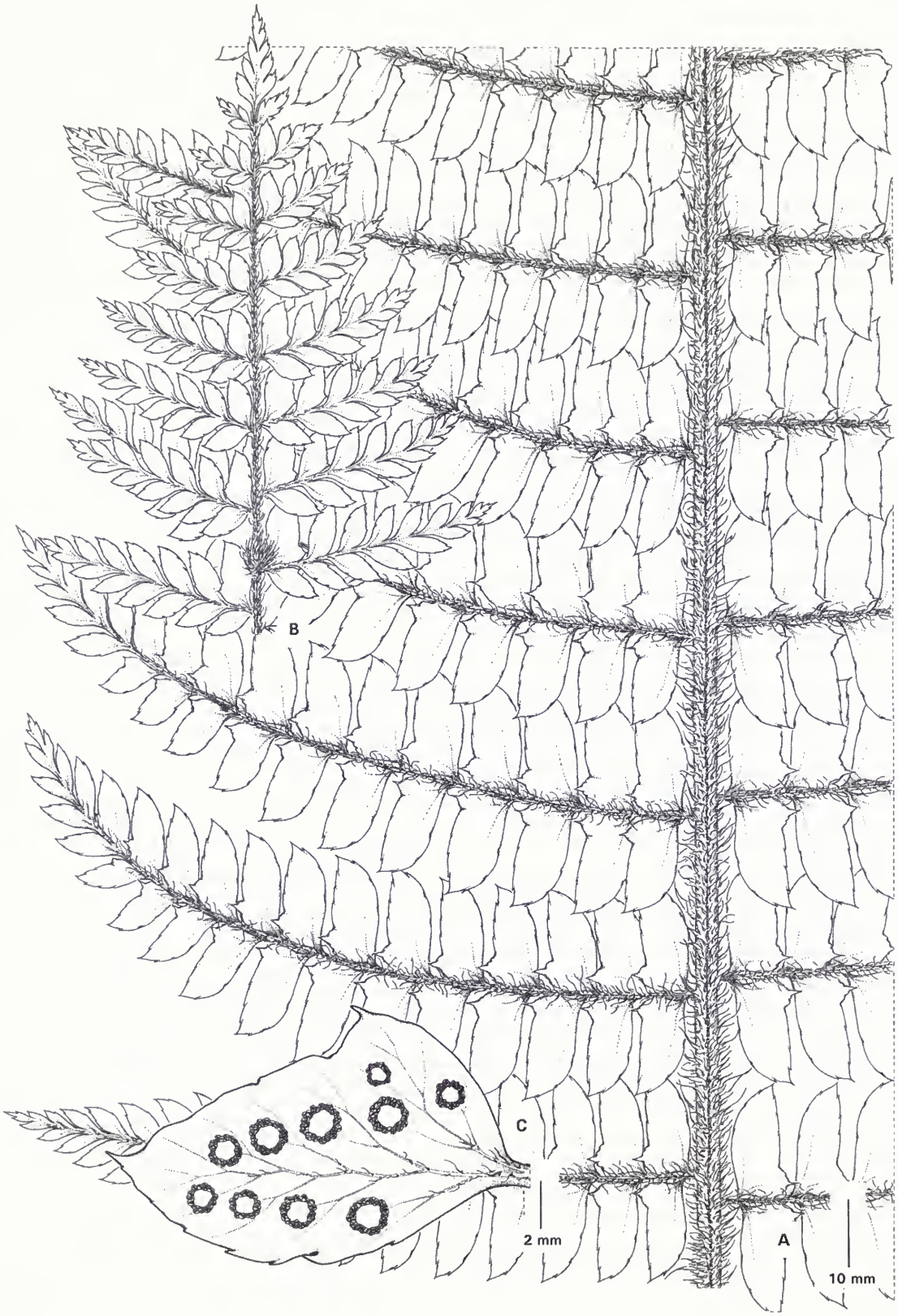

Fig. 5 *Polystichum kilimanjaricum*. A, proximal pinnae of lamina; B, lamina apex showing proliferous bud; C, abaxial surface of fertile pinnule. All drawn from *Pichi Sermolli* 5171 (Herb. PIC.SERM.).

pinnate, with up to 14 free pinnule pairs, not overlapping proximally, the basal pinnae not or slightly reduced in size, often somewhat deflexed, ovate, narrowly ovate or oblong-attenuate, to 140 × 35 mm: *pinna-rachis* stramineous, adaxially sulcate, set with acicular paleae with numerous long and often twisted outgrowths at the base, the apex terminating in an acicular cell, to 7 mm long: *pinnules* slightly imbricate, short-stalked proximally, firm-herbaceous to subcoriaceous, adaxially olive-green, somewhat paler abaxially, inaequilateral, ovate-rectangular to ovate-rhomboid, basiscopically cuneate, acroscopically truncate and weakly auriculate, shallowly undulate or serrate, the teeth and aristae bent inwards, the auricle and apex aristate, the proximal acroscopic and basiscopic pinnules on basal pinnae often slightly reduced in size, the proximal acroscopic and basiscopic pinnules on upper half of lamina slightly larger than the next, to 20 × 10 mm; adaxially sparsely set with short-stalked, acicular, somewhat twisted paleae, often with a few long straight or twisted, often branched outgrowths at the base, the apex terminating in an acicular cell, to 2.5 mm; abaxial surface with similar paleae but more densely set. *Venation* immersed or raised. *Sori* circular, *c.* 1.4 mm in diameter, terminal on abbreviated vein branches, uniseriate or biseriate on acroscopic auricle, discrete: *sporangium* with 8–(13)–20 indurated annulus cells; stalk eglandular: *indusium* peltate, subcircular to irregular, the maximum radius 0.73–(0.87)–1.02 mm, persistent, brown. *Spores* brown, the perispore folded to form inflated or compressed tubercles, echinulate, verruculate to echinulate, sparsely to closely perforated, the exospore 34–(43.44)–56 × 26–(32.45)–44 µm. *Chromosome number* unknown.

MATERIAL EXAMINED

TANZANIA: Kilimanjaro, below 1st hut, Machame Route, 2950 m, *Schippers* T1465 (WAG); Kilimanjaro, above Mandare Hut, 1830 m, *Schippers* T1234A (WAG).

DIAGNOSTIC FEATURES AND RELATIONSHIPS. *Polystichum kilimanjaricum* is characterized by the proliferous buds on the lamina and the palea morphology. Paleae on the proximal part of the stipe are narrowly triangular and are either castaneous throughout, or may often have a very narrow paler brown margin. Larger paleae higher up the stipe have an ebeneous to castaneous centre and a broader ferrugineous to stramineous margin. These paleae are mostly oblique in outline. Larger paleae on the upper two-thirds of the stipe are ovate to broadly ovate in outline with only the central part of the apices being ferrugineous to castaneous in colour.

Pichi Sermolli (1972) considered this species to closely resemble *P. pauciaculeatum* Bonap. (as *P. coursii* Tardieu) and *P. tsaratananense* Tardieu from Madagascar and went on to describe how *P. kilimanjaricum* can be distinguished from them. Morphologically *P. kilimanjaricum* is more similar to *P. tsaratananense* than it is to *P. pauciaculeatum*. *Polystichum kilimanjaricum* belongs to section *Lasiopolystichum* Daigobo.

DISTRIBUTION AND ECOLOGY. *Polystichum kilimanjaricum* appears to be endemic to Mount Kilimanjaro in Tanzania, occurring at elevations ranging between 1830 and 2950 m. The species is evidently confined to the *Hagenia abyssinica* montane forests and thickets associated with the Ericaceous belt where it mostly occurs on the forest floor and on rocky streambanks.

5. **Polystichum aculeatum** (L.) Roth, *Tent. fl. Germ.* **3**(1): 79 (1799). Type as for *Polypodium aculeatum* L.

Fig. 6.

Polypodium aculeatum L., *Sp. pl.*: 1090 (1753). Type: Habitat in Europa. H.L.B. 908,311.72 (L-lectotype, designated by Alston (1940)).

Polypodium lobatum Huds., *Fl. angl.*: 390 (1762). Type: Habitat in umbrosis et ad sepes. Haller, *Hist. stirp. Helv.*: 1712 (1768); Pluk., *Phytographia*: 180, f. 1 (1691); Ray, *Syn. meth. stirp. brit.*: 121 (1690)-syntypes.

Aspidium aculeatum (L.) Sw. in *Jl. Bot. (Schrader)* **1800**(2): 37 (1801).

Aspidium lobatum (Huds.) Sw. in *Jl. Bot. (Schrader)* **1800**(2): 37 (1801).

Polystichum lobatum (Huds.) Bastard, *Essai fl. Maine et Loire*: 367 (1809). Chevall., *Fl. Belg., Ptérid.*: 107 (1950).

Dryopteris aculeata (L.) Kuntze, *Revis. gen. pl.* **2**: 812 (1891).

Dryopteris setifera subsp. *lobata* (Huds.) Maire in E. Jahandiez & R.C.J.E. Maire, *Cat. pl. Maroc* **1**: 3 (1931).

Plants terrestrial or epilithic. *Rhizome* short, erect to suberect, to 120 mm long, to 15 mm in diameter, set with roots, closely spaced persistent stipe bases, and paleae. *Fronds* crowded, caespitose, 8–11 per plant, erect to arching, to 935 mm long: *stipe* proximally castaneous, stramineous distally, adaxially sulcate, to 170 mm long × 6 mm in diameter, proximally densely set with conspicuously larger and smaller paleae, moderately paleated distally; larger paleae sessile, castaneous, chartaceous, broadly ovate, cordate, the margins proximally closely set with short curved outgrowths, the apex usually short-flagelliform, terminating in a small thin-walled cell, to 15 × 9 mm; smaller paleae sessile, castaneous to stramineous, chartaceous, lanceolate or narrowly to broadly ovate, cordate to cordate-imbricate, the margins proximally with short curved outgrowths, the apex terminating in a subulate cell or a small thin-walled cell: *lamina* 2-pinnate, with up to 41 free pinna pairs, coriaceous, adaxially dark green, slightly paler abaxially, narrowly elliptic, to 770 mm long, closely spaced and often imbricate distally, proximally more widely spaced, the proximal pinnae reduced, often slightly deflexed: *rachis* stramineous, adaxially sulcate, moderately paleated; paleae sessile, ferrugineous, chartaceous, broadly ovate, ovate, narrowly elliptic or hastate, cordate to cordate-imbricate, the margins with short, somewhat curved outgrowths extending nearly to the apex, the apex terminating in a subulate cell, a long acicular cell, or a small thin-walled cell, to 6 × 3 mm: *pinnae* short-stalked, pinnatifid to 1-pinnate, with up to 16 free pinnule pairs, narrowly oblong-attenuate, the middle pinnae to 110 mm long, the proximal pinnae to 88 mm long: *pinna-rachis* stramineous, adaxially sulcate, moderately paleated; paleae sessile or short-stalked, ferrugineous, chartaceous, ovate, narrowly lanceolate to hastate, cordate to cordate-imbricate, the margins proximally with short or long, usually curved outgrowths, the apex terminating in a subulate cell or a small thin-walled cell, to 2 × 0.8 mm: *pinnules* opposite to alternate, somewhat imbricate, the proximal acroscopic pinnule usually slightly longer than the next, asymmetric, trullate to narrowly trullate, basiscopically cuneate, acroscopically cuneate to truncate and auriculate, serrate to long-aristate, to 15 mm long; adaxially with a few membranous, filiform paleae terminating in a subulate or thin-walled cell confined to proximal part of pinnule, to 1.75 mm long; abaxially moderately set with membranous, narrowly trullate or narrowly lanceolate paleae with a few short and straight marginal outgrowths, or the paleae filiform, short-stalked, with the apex terminating in a subulate cell or a small thin-walled cell, to 2.5 mm long. *Venation* immersed. *Sori* circular, to 1.5 mm in diameter, terminal or near terminal on abbreviated vein branches, essentially uniseriate, discrete to confluent at maturity: *sporangium* with 12–(13)–17 indurated annulus cells; stalk eglandular: *indusium* chartaceous, peltate, circular, entire to repand, the maximum radius 0.63–(0.92)–1.26 mm, persistent, brown. *Spores* brown, the perispore folded to form short echinate ridges or crests, the areas between

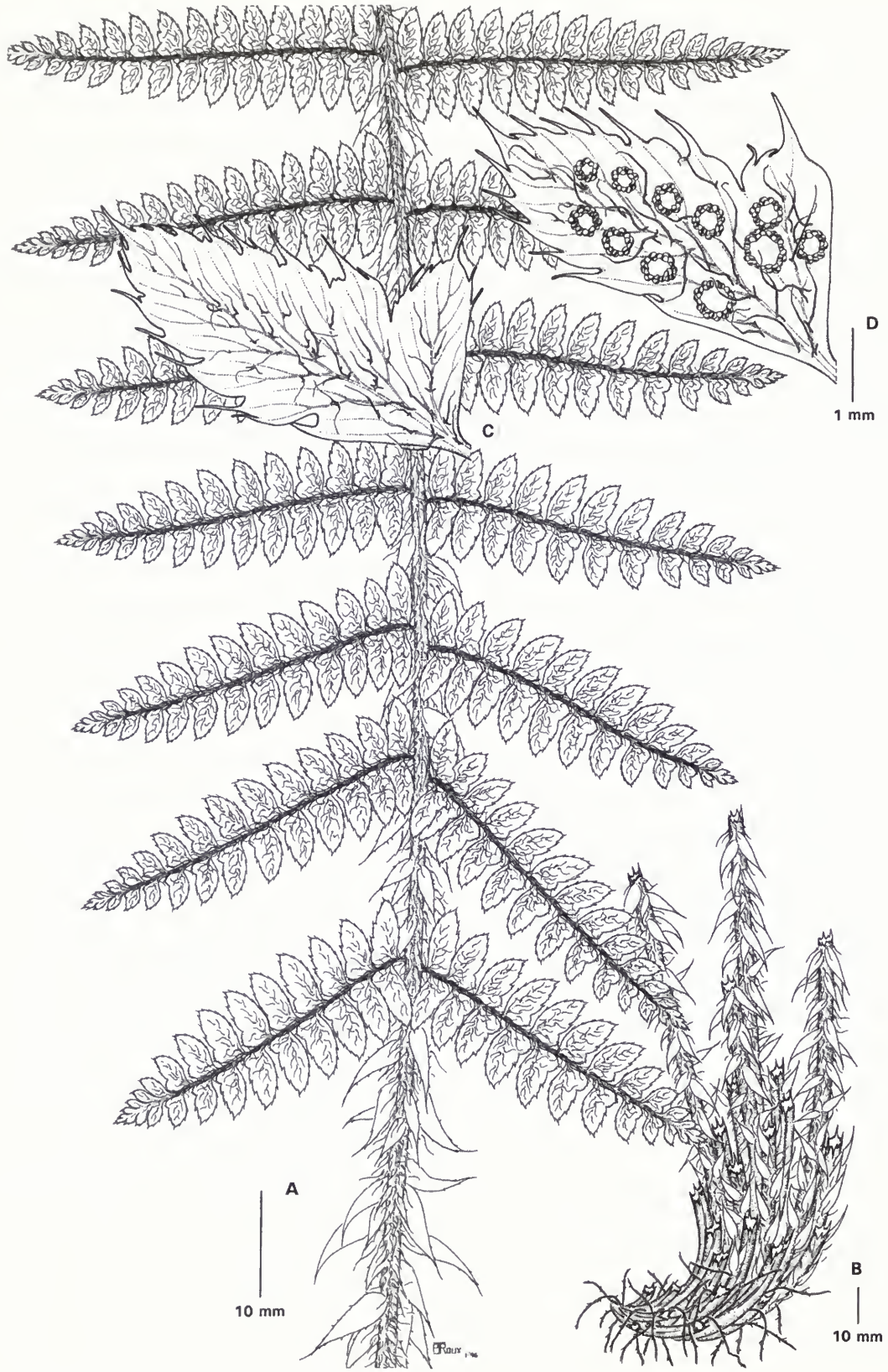

Fig. 6 *Polystichum aculeatum*. A, proximal part of lamina; B, fertile pinnae; C, rhizome. A & B drawn from *Lindberg* 2793 (B); C, drawn from *Cosson* s.n. (S).

fenestrate with pores of variable sizes, the exospore 32–(37.46)–48 × 24–(27.93)–34 µm. *Chromosome number* 2n=164 (Manton, 1950).

MATERIAL EXAMINED

ALGERIA: Montagnes du Djurdjura, cercle de Dra el Mizan, *Cosson* s.n. (B); La Gourraya de la Bougie, *Còrzeillea Terè* s.n. (S).

MOROCCO: Haut Atlas, Ourika, 1400 m, *Litardière* s.n. (M, P); Great Atlas Mountains, Si Chamharouch, ± 2280 m, *Polunin* 2184 (BM); N. face Gbou Orionl, 2950 m, *Newbould* 109, 110 (BM); Arromiel, *Balls* 2972 (B, BM, S); Taddert, Marrakesh-Quarzazat road, High Atlas, 1600 m, *Chatworth-Musters* 362 (BM); Atlas Magnum, Amismiz, ± 1400 m, *Lindberg* 2793 (B, S); Meknès, Aguelmane Azigza, 1600 m, *Casas* et al. s.n. (B); Grand Atlas, Ourika, 1300–1400 m, *Maire* s.n. (RAB); Haut-Atlas, Ourika, ± 2600 m, *sine coll.* s.n. 18633 (RAB); env. de la maison forestièr de Khanolak-Anasar, *Jovet-Ast* et al. 13313 (RAB).

Variation in *Polystichum aculeatum* and *P. setiferum* and the occurrence of intermediate forms and hybrids (*P.* × *bicknellii* (H. Christ) Hahne) between these species have resulted in diverse interpretations as to their delimitation. The result has been some nomenclatural confusion (Newman, 1844; Alston, 1940; Elliot, 1950; Meyer, 1960).

Hudson (1762), unaware of the existence of the name *Polypodium setiferum* Forssk., recognized two forms in European *P. aculeatum* and divided plants into two species. The rigid and less divided form he named *Polypodium lobatum*, and the lax and more divided form he retained in *P. aculeatum*. Hudson's interpretation of *P. aculeatum* is therefore synonymous with *P. setiferum* (Forssk.) T. Moore ex Woyn. and *P. lobatum* with *P. aculeatum* as now interpreted. Although the name *P. lobatum* never became well-established, arguments in favour of its retention were made by Meyer (1960).

DIAGNOSTIC FEATURES AND RELATIONSHIPS. *Polystichum aculeatum* is a fertile sexual species intermediate in morphology between *P. lonchitis* (L.) Roth and *P. setiferum* (Forssk.) T. Moore ex Woyn., although it is closer in appearance to the latter. Manton (1950) demonstrated *P. aculeatum* to be a tetraploid of hybrid origin between the putative parents *P. lonchitis* and *P. setiferum*. Daigobo (1972) placed this species and *P. setiferum* in different sections, but their palea morphology suggests them to be related. Both belong to section *Metapolystichum* Daigobo.

Polystichum aculeatum is characterized by having a coriaceous lamina and smooth, shiny, dark green pinnules. The longest pinnae occur at or near the middle of the lamina with the most proximal pinna pair distinctly shorter than the middle pinnae. The stipe/lamina ratio in *P. aculeatum* is 1:3.27 (n=12). Palea density and morphology are also diagnostic and differ from that of *P. setiferum* with which it may be confused. In *P. aculeatum* the stipe, rachis and pinna-rachis are moderately paleated, whereas in *P. setiferum* they are usually densely set with twisted paleae. Marginal outgrowths in larger paleae are short and curved, and gradually phase out towards the apex. Smaller paleae are mostly broad-based and have short curved marginal outgrowths, but distally they terminate abruptly in an almost simple subulate apex. Paleae occurring abaxially on the pinnules are short and proximally bear a few small, straight or curved, marginal outgrowths, with the apex terminating in a subulate cell or a small thin-walled cell. *Polystichum aculeatum* also differs from *P. setiferum* in a number of micromorphological characters, with the mean adaxial epidermal cell length, guard cell length, maximum radial length of the indusium, and the spores being larger than those in *P. setiferum*.

VARIATION. *Polystichum aculeatum* varies in the degree to which the pinnae reduce in size towards the base of the lamina and in the length of the stipe in relation to the length of the lamina. European plants appear to have shorter stipes than plants from Africa. Pinnules of plants from the study area are remarkably stable and show little variation.

DISTRIBUTION AND ECOLOGY. *Polystichum aculeatum* is widespread in Europe but in North Africa its distribution is more restricted. Hansen & Sunding (1993) and Derrick et al. (1987) considered the species to also occur on Madeira and the Canary Islands, but no material originating from Madeira could be traced by Manton et al. (1986), Gibby & Paul (1994), or myself. I have also not seen any material of this species from the Canary Islands.

In Algeria and Morocco *Polystichum aculeatum* is restricted to the High Atlas Mountains. The lithology of the region consists largely of basement rock and unconsolidated clay marls (White, 1983). The rainfall is low and seasonal at lower elevations but at higher elevations precipitation may occur throughout the year. The species occurs at elevations ranging between 1400 m and 2950 m, where it is confined to moist shaded rock crevices along streams and at waterfalls.

6. **Polystichum setiferum** (Forssk.) T. Moore ex Woyn. in *Mitt. Naturwiss. Vereines Steiermark* **49**: 181 (1913). Type as for *Polypodium setiferum* Forssk.

Fig. 7.

Polypodium setiferum Forssk., *Fl. aegypt.-arab.*: 185 (1775). Type: Turkey, Dardanelles ('Ad Dardanellos'), *Forsskål* 814 (C!-lectotype, designated by Hepper & Friis (1994)).

Aspidium angulare Kit. ex Willd., *Sp. pl.* 4, **5**(1): 257 (1810). Type: Habitat in Hungaria, *sine coll.* s.n. (B-Willd.-holotype, NBG!-photograph).

Aspidium hastulatum Ten., *Semina 1830*: 15 (1830). Type: In nostri regni nemoribus, et abunde in vallibus circa Neapolim, *S. Rocco, Ponti Rossi & Camaldoli* s.n. (not located).

Polystichum angulare (Kit. ex Willd.) C. Presl, *Tent. pterid.*: 83 (1836).

Aspidium aculeatum subsp. *angulare* (Kit. ex Willd.) Asch. in P.F.A. Ascherson & K.O.R.P.P. Graebner, *Syn. mitteleur. Fl.* **1**: 39 (1896).

Polystichum aculeatum subsp. *angulare* (Kit. ex Willd.) Vollm., *Fl. Bayern*: 9 (1914).

Dryopteris aculeata subsp. *angularis* (Kit. ex Willd.) Schinz & Thell. in H. Schinz & R. Keller, *Fl. Schweiz* 3rd ed., **2**: 3 (1914).

Dryopteris setifera (Forssk.) Woyn. ex Schinz & Thell., *Vierteljahrsschr. Naturf. Ges. Zürich* **60**: 340 (1915).

Dryopteris setifera subsp. *angularis* (Kit. ex Willd.) Maire in É. Jahandiez & R.C.J.E. Maire, *Cat. pl. Maroc* **1**: 3 (1931).

Plants terrestrial or epilithic. *Rhizome* erect to suberect, short, to 18 mm in diameter, set with roots, closely spaced stipe bases, and paleae; paleae broadly attached, stramineous to ferrugineous, chartaceous, ovate to broadly ovate, often somewhat bullate, cordate, the margins minutely fimbriate to erose, the apex generally entire, terminating in a subulate cell or a small thin-walled cell. *Fronds* 8–22 per plant, suberect to arching, to 1.2 m long: *stipe* proximally castaneous, stramineous distally, adaxially sulcate, to 520 mm long × 6 mm in diameter, densely paleated; paleae ferrugineous, chartaceous, the larger paleae sessile, narrowly ovate, ovate, or broadly ovate, often somewhat bullate, cordate, the margins finely fimbriate to erose, the apex entire, terminating in a subulate cell or a thin-walled cell, to 20 × 11 mm, the smaller paleae narrowly oblong, narrowly ovate, or subulate, mostly helically twisted, short-stalked, cordate-imbricate, the margins proximally with short and/or long outgrowths, the outgrowths straight, narrowly triangular, or angular, reduced in size towards the apex, the apex terminating in a

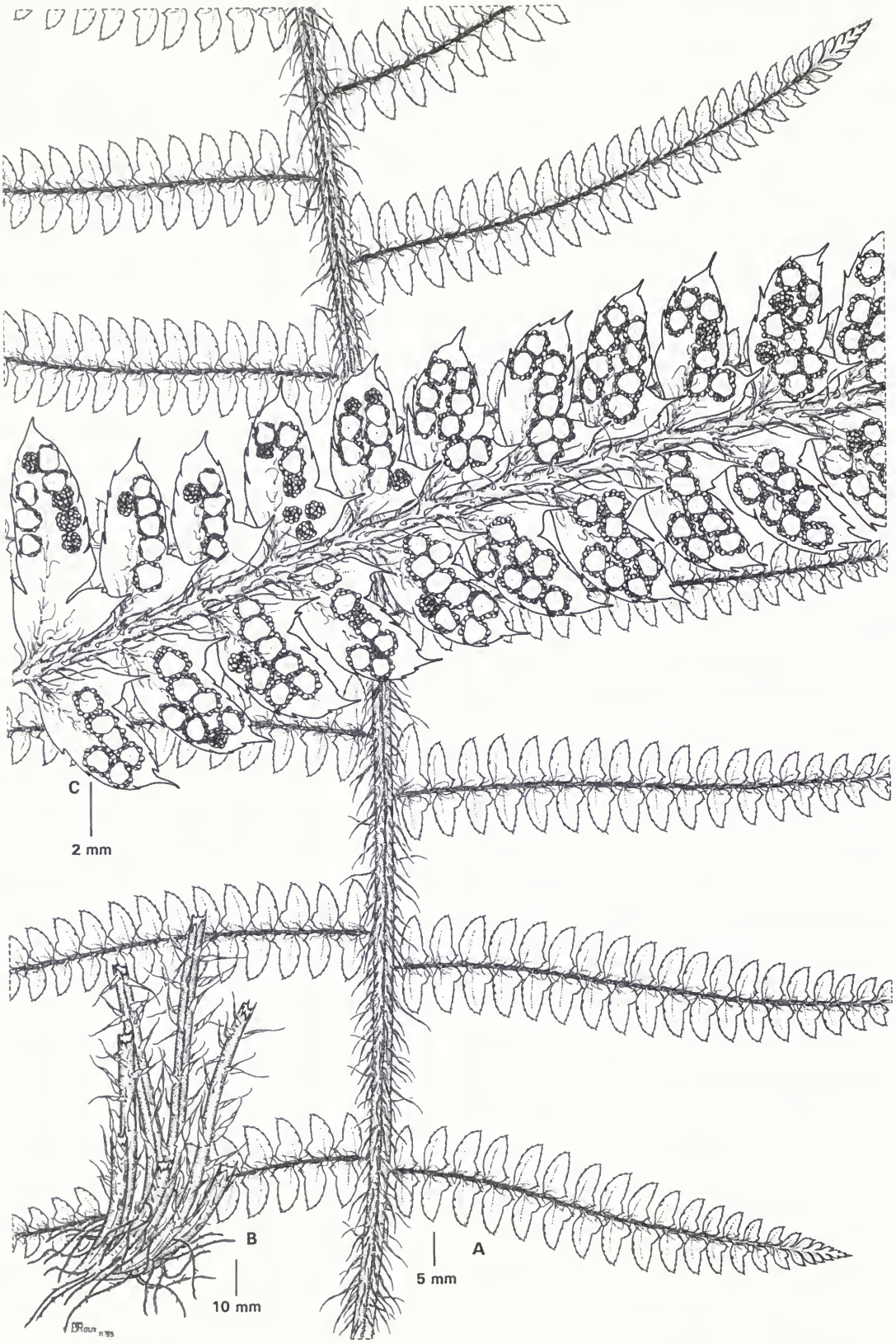

Fig. 7 *Polystichum setiferum.* A, proximal part of lamina; B, rhizome; C, abaxial surface of fertile pinna. A & C drawn from *Mandon* 291 (S); B, drawn from *Tullgren* 21 (S).

subulate cell or a small thin-walled cell: *lamina* 2-pinnate to 2-pinnate-pinnatifid, with up to 45 free pinna pairs, firmly herbaceous to coriaceous, dark green adaxially, somewhat paler abaxially, ovate to elliptic, to 830 mm long, the proximal pinnae reduced, often somewhat deflexed: *rachis* stramineous, adaxially sulcate, densely paleated; paleae narrowly oblong, narrowly ovate, narrowly lanceolate, or subulate-hastate, helically twisted, short-stalked, cordate to cordate-imbricate, the margins proximally with short and/or long straight, curved or angular outgrowths that reduce in size towards a usually entire apex, the apex terminating in a subulate cell or a small thin-walled cell, to 6 × 2 mm: *pinnae* with up to 26 free pinnule pairs, closely to widely spaced, often overlapping towards the apex, narrowly oblong-attenuate, the middle pinnae to 162 mm long, the proximal pinnae to 140 mm long: *pinna-rachis* stramineous, adaxially sulcate, moderately to densely set with paleae similar to but smaller than those on the rachis: *pinnules* opposite to alternate, closely spaced, the proximal acroscopic pinnule not or slightly enlarged, inaequilateral, acroscopically auriculate, trullate or oblong-acuminate, lobate-dentate, aristate, to 13 × 5 mm; adaxially with a few twisted filiform paleae confined to the costa on the proximal part of the pinnule, these terminating in a subulate cell or a small thin-walled cell, to 4.5 mm long; abaxially moderately set with narrowly triangular, subulate-hastate, or filiform paleae, the larger paleae proximally usually with a few long marginal outgrowths, the apex entire, terminating in a subulate cell, to 2.9 mm long. *Venation* immersed. *Sori* circular, *c.* 1 mm in diameter, terminal or near terminal on abbreviated vein branches, essentially uniseriate, discrete to confluent at maturity: *sporangium* with 11–(14)–20 indurated annulus cells; stalk eglandular: *indusium* pale brown, persistent, peltate, circular, repand, the maximum radius 0.48–(0.85)–1.21 mm. *Spores* 64 per sporangium, brown, the perispore folded to form inflated tubercles and ridges, echinulate to verruculate, sparsely perforated, the exospore 26–(34.52)–44 × 18–(25.92)–36 µm. *Chromosome number* 2n=82 (Manton et al., 1986).

MATERIAL EXAMINED

ALGERIA: Mont Magnis, 1500 m, *Reverchon* 371 (BM, P); Djebel Edough, *Cosson* s.n. (P); gorge de la Chiffa, *Cosson* s.n. (P); Djebel Marouf, petite Kabylie, Prov. de Constantine, *Cosson* s.n. (P); dans la fout du Dirah aux environs d'Aumale, *Chaoy* 834 (P); montagnes du Djurdjura, cerde de Dra el Mizan, Prov. d'Alger, *Cosson* s.n. (P); 3 miles W. of the Hotel Lambert, Adekar, *c.* 900 m, *Alston & Simpson* 37578 (BM); Djebel, *Stephenson* s.n. (BM); Romain, Nud el Kebin, Alwah, *sine coll.* s.n. (BM); Algeria, *Eichard* s.n. (WAG).

MOROCCO: entre les rochers humides et umbrage du mont Amareza, Atlas, *Bové* s.n. (P); Al Hoceima. cerca de Ketama, subiendo al monte Koudiet Imoûgrâs, 1880 m, *Casas* 7237 (B); Hafa-es-Sabbaba (Ben-Hosmar), ad 500 m, *Quer* s.n. (B, S).

TUNISIA: NV d'aïn-Draham, *Cosson* s.n. (P); Massif d' El-Fedja, *Cosson & Duval* s.n. (P); Ain Draham, open cork-oak forest, *c.* 900 m, *Simpson* 38370 (BM); forêt du Feidja, 20 km W. of Ghardimaou, 800 m, *Jansen* 462 (WAG).

WITHOUT EXACT LOCALITY: Herb. Luerssen 5242, *sine loc.* (P); loco incerto, *sine coll.* B-96812 (B); loco incerto, *De Buch* s.n. (B); Kaap de Goede Hoop [error, not a native of the Cape], *sine coll.* 9 (L).

DIAGNOSTIC FEATURES AND RELATIONSHIPS. Problems are frequently experienced in separating *Polystichum setiferum* from *P. aculeatum.* The former, however, has larger fronds that are softer in texture. Also the proximal pinnae are not usually markedly reduced in *P. setiferum* as they are in *P. aculeatum.* In *P. setiferum* the paleae are characteristically helically twisted and the apices more frequently terminate in a small thin-walled cell than those of *P. aculeatum.* Micromorphological characters separating the two taxa are reported under *P. aculeatum.*

VARIATION. Considering the wide geographical distribution of the species, it shows remarkably little variation. Dyce (1963) reported that a wide range of minor variations in shape and habit can be expected in any colony of this species. I found variations in the size and shape of the fronds to be most pronounced, but since no obvious geographic pattern was detected, it is here considered to be environmentally induced. Plants from drier areas, in particular the North African region, have fronds that are often merely 1-pinnate or 1-pinnate-pinnatifid. In large specimens from moist areas, however, the lamina may be 2-pinnate-pinnatifid with the proximal acroscopic pinnule being 1-pinnate and often twice as long as the next pinnule. Irrespective of habitat and environmental conditions, the palea structure shows little variation.

DISTRIBUTION AND ECOLOGY. *Polystichum setiferum* is widespread in Britain, Europe south of 53° N latitude, the Crimea, Macaronesia (Azores, Canary Islands and Madeira), and Africa north of the Sahara.

In North Africa *P. setiferum* occurs at elevations ranging between 500 and 1880 m in the Saharan Atlas-, High Atlas- and Anti-Atlas Mountain ranges in Tunisia, Algeria and Morocco. In this region of low rainfall plants are restricted to well-protected rock crevices and moist banks. In Tunisia, however, the species also occurs in open cork-oak (*Quercus suber* L.) forests.

7. **Polystichum transvaalense** N.C. Anthony in *Contr. Bolus Herb.* **10**: 146 (1982). Type: South Africa, Transvaal (Northern Province), Pietersburg District, Woodbush Forest Reserve, *Bredenkamp & Van Vuuren* 450 (BOL!-holotype; PRE!-isotype). Fig. 8.

Plants terrestrial or epilithic. *Rhizome* short, erect, to 8 mm in diameter, densely set with roots, persistent stipe bases, and paleae; paleae broadly attached, castaneous, chartaceous, narrowly linear to narrowly lanceolate, the margins proximally entire, distally with numerous short, apically or basally directed outgrowths, the apex terminating in an acicular cell, to 14 × 1 mm. *Fronds* caespitose, 5–17 per plant, suberect to arching, to 1.045 m long: *stipe* proximally castaneous, stramineous distally, adaxially sulcate, to 535 mm long × 5 mm in diameter, densely paleated, the paleae twisted; larger paleae mostly confined to the stipe, concolorous or bicolorous, castaneous to ferrugineous or with the central part castaneous to black, rugose, narrowly ovate-acuminate to ovate-acuminate, short-stalked, the margins irregularly lacerate-fimbriate, the apex terminating in an acicular cell, to 20 × 6 mm; smaller paleae short-stalked, narrowly ovate to narrowly lanceolate, the margins proximally lacerate, distally irregularly lacerate-fimbriate, the apex terminating in an acicular cell, to 6.5 × 1.4 mm: *lamina* 2-pinnate, with up to 26 free pinna pairs, herbaceous, ovate to narrowly ovate, to 670 mm long, pale green adaxially, paler abaxially, the proximal pinnae often slightly reduced, often deflexed: *rachis* stramineous, adaxially sulcate, often flexuous distally, densely paleated; paleae short-stalked, twisted, castaneous to ferrugineous, narrowly ovate, narrowly triangular, or linear, the margins proximally lacerate, distally irregularly and widely fimbriate, the apex terminating in an acicular cell, to 4.5 mm long: *pinnae* 1-pinnate, with up to 20 free pinnule pairs, proximally widely spaced, distally closely spaced and somewhat overlapping, oblong-attenuate, the basal pinnae to 140 mm long × 28 mm wide, proximally often slightly reduced, the basalmost acroscopic pinnules longer towards the middle of the lamina: *pinna-rachis* stramineous, adaxially sulcate, densely paleated; paleae similar to but smaller than those on the rachis: *pinnules* opposite to alternate, inaequilateral, acroscopically auriculate, ovate to obliquely transversely rhomboid, to 15 mm long,

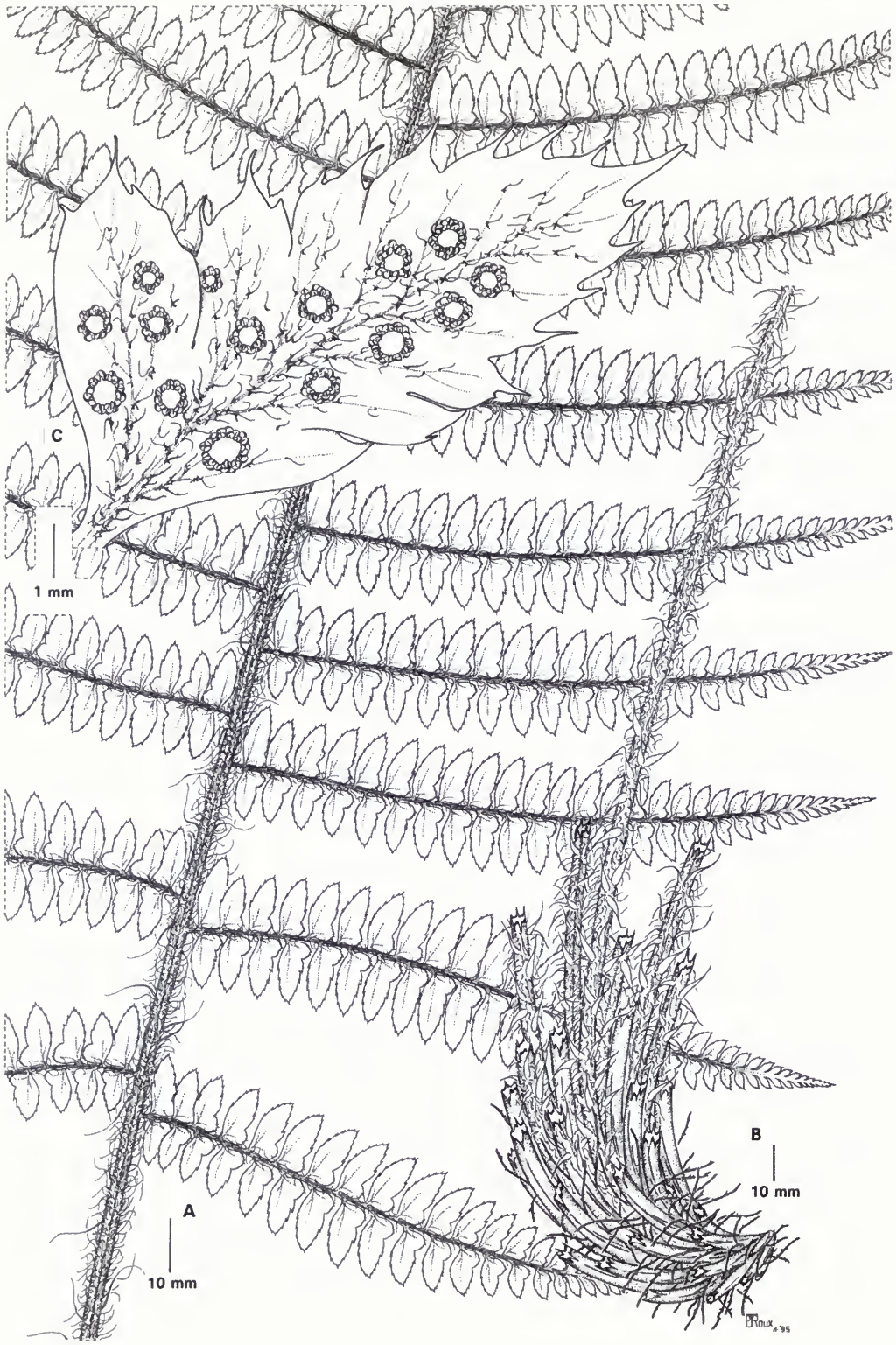

Fig. 8 *Polystichum transvaalense*. A, proximal part of lamina; B, rhizome; C, abaxial surface of fertile pinnule. All drawn from *Roux* 2414 (NBG).

serrate to lobate-serrate, often short-aristate, the proximal pinnules often pinnatifid; adaxially subglabrous or with a few twisted, filiform paleae proximally on costa, the apex terminating in an acicular cell, to 2 mm long; abaxially moderately paleated; paleae short-stalked, twisted, narrowly linear to narrowly triangular, the margins proximally long-lacerate or fimbriate, the apex terminating in an acicular cell, to 2.5 mm long. *Venation* immersed. *Sori* circular, *c.* 1 mm in diameter, terminal or near terminal on abbreviated vein branches, discrete at maturity: *sporangium* with 10–(14)–22 indurated annulus cells; stalk eglandular: *indusium* stramineous, peltate, circular, simple or often with a few long central processes, repand to erose, persistent, the maximum radius 0.48–(0.76)–0.97 mm. *Spores* 64 per sporangium, brown, the perispore folded to form tubercles and inflated or compressed reticulate ridges, echinulate, closely perforated, the pores to 1.5 μm in diameter, the exospore 30–(38.54)–48 × 22–(28.86)–38 μm. *Chromosome number* 2n=164.

MATERIAL EXAMINED

BIOKO: Bioko (Fernando Po), 9000 ft, *Mann* 340 (K); carratera del pico Basilé, km 18–19, nacimento del río Cope, 32NMJ7597, 2470 m, *Carvalho* 3682 (B, BR).

CAMEROON: Pisted'Acha-Abaw au lac Oku, 40 km NE Bamenda, *Letouzey* 13439 (P); montane forest between hut 1 and hut 2, 1950 m, *Breteler* et al. 266 (K, P, WAG); Buea, *Preuss* 719 (B); Mannsquell, *Luckhardt* 636 (B); Mount Cameroon, *Kalbreyer* 133 (B); Uauenzuba, 1900 m, *Schaeter* 90 (B).

DEMOCRATIC REPUBLIC OF CONGO: Mare de Kikeri, Volcan Hekeno, *Jean-Louis* 5191 (BR, P, PRE); entre le Hikeno et le Heisfumangabo, *Jean-Louis* 5002 (BR, P, PRE); Kivu Province, Goma, petite mare de Kikeri, au pied du Mikeno Parc National Albert, 2200 m, *Lebrun* 7225, 7228 (BR, K, P); entre Kibumba et le Ngamuragira, *Lebrun* 7087 (BR, P); Kivu, Parc des Virunga, Karisimbi, vers le SW Zaïre, 3465 m, *Van der Veken* PV 9130 (B); Kivu, Buhavu-Goma, *Gupffert* 169 (BR); 7°48′S, 29°44′E, Marungu route Kieluzi-Mwela km 45 Ravin Lukole, 1890 m, *Bodenghiem & Malaisse* 1459 (BR); Parc National Albert, versant S. du Mikens, 2400–2600 m, *Lebrun* 7307 (BR); Omigi, Mickule, *Bequaert* 6294 (BR); route Goma-Rwindi 30 km, *Breyne* 1785 (BR); Volcan Niamlagyra, *c.* 2000 m, *Germain* 1381 (BR); Kivu, Rumangabo, 1525 m, *Germain* 3025 (BR); Numbi territory, Kalehe, 2300 m, *Leonard* 4554 (BR); Mt. Kiniki territory, 1960 m, *Gutzwiller* 1236 (BR); Mt. Kiniki, Wambalyro, 1960 m, *Gutzwiller* 1106 (BR); Parc National Albert, Kalonge, Butahu, vallée du la Nyamwumba, 2010 m, *Demaret* 5192 (BR).

ERITREA: Eritrea-Assaorta: bosco del Caribozza, *c.* 2700 m, *Pappi* 2812 (BOL, BR).

ETHIOPIA: *c.* 5 km NW of Addis Ababa, *c.* 2500 m, *De Wilde* 5981 (BR, ETH, WAG); Kaffa Province, 35 km W. of Bonga along the road to Shewa Ghimmira, *c.* 1950 m, *Friis* et al. 2171 (ETH, K); near Wush-Wush, *c.* 20 km NW of Bonga, *c.* 1800 m, *De Wilde* 7756 (BR, ETH, WAG); Gara Ades, *Burger* 2580 (K); Mount Wachacha, near Addis Ababa, 2400 m, *Mooney* 7895 (K); Wofasha Forest, Shoa, *Mooney* 7003 (K); Bellete State Forest, ± 40 km SW of Jimma, *c.* 2000 m, *De Wilde* 6999 (BR, WAG); Kaffa Province, village *c.* 2 hours walk NW of Maji, 2200 m, *De Wilde* 6194 (BR, WAG); W. slope of Mount Uociacia, *c.* 15 km W. of Addis Ababa, 2700 m, *De Wilde* 9580 (WAG); Mount Uociacia, *c.* 15 km W. of Addis Ababa, *c.* 2600 m, *De Wilde* 8532 (WAG); Kaffa Province, Limmu, Monti Botor, *c.* 2250 m, *Pichi Sermolli* 7069 (SRGH); 7°17′N, 36°5′E, Kaffa Province, 35 km W. of Bonga along the road to Shewa Ghimmira, 1950 m, *Friis* 2171 (BR).

KENYA: Nyambeni Hills, base of Kirima, 6400 ft, *Polhill & Verdcourt* 295 (BR, K, PRE); Aberdares, Cave Waterfall, *Coe* 794 (PRE); Molo, Maü Escarpment, 2440 m, *Alluaud* 55 (BR, P, PRE); Kiambu District, Katamayu River Forest, 2200–2250 m, *Faden & Evans* 69/236 (BOL); Meru District, Ngambeni Hills, above Kiegoi, 2250 m, *Faden* et al. 69/678 (K); Aberdares, S. Kinangop, 8600 ft, *Molesworth-Allen* 3637 (K); Kericho District, crossing at the Kitinges River, *c.* 8 km ENE of Kericho, 2060 m, *Faden* 72/302 (K); Kericho District, W. Mau Forest, SW of Mt. Blacket, *Faden* et al. 72/356 (K); Samburu District, Nyiro Mountain, 2400 m, *Bono* 23 (K); Taita Hills, Vuria Hill, 1920–2200 m, *Faden* 72/255 (BOL, K); Kinangop, Brown Trout Inn, 9000 ft, *Verdcourt* 880 (K); S. Kinangop, near Brown Trout Inn, *Molesworth-Allen* 3620 (K); Kinangop, above Isanga farm, 8500 ft, *Andrews* 4461 (K); Chyulu Hills, 6800 ft, *Van Someren* 7572 (K); Chyulu Hills, 2250 m, *Bally* 1163 (K); Mount Meru, 5000–6000 ft, *Leighton* s.n. (K); Aberdare Range, base of Mount Kenya, *Dawson* 96a (K); Taita Hills, Vuria Forest, *c.* 7000 ft, *Schippers* K271 (WAG); Thompson Falls, *c.* 7600 ft, *Schippers* K17 (WAG); Kinangop, Brown Trout Inn, *Verdcourt & Moggi* 2486 (B, SRGH); Elgon Forest, *Webster* 9055 (K); prope 'West Kenia Forest Station', 2300 m, *Friis* 594 (B, BR, S); Mount Elgon, 4300 ft, *Barrele* 92 (NU); Aberdare Range, near W. part of the Nyeri track, 3100 m, *Hedberg* 1533 (S); Samburu District, Mt. Nyiru, 8000 ft, *Cameron* 147 (BR).

LESOTHO. 2927 (Maseru): gorge dans la montagne Ma-Khrarane, au dessus de la station missionaire de Morija (DA), *Dieterlen* 1309 (P, PRE).

MALAWI: Nyika, Zovochipolo, 2225 m, *La Croix* 4634 (PRE); Nyika Plateau, Zovochipolo forest patches, 2200 m, *Dowsett-Lemaire* 297 (MAL); Kirk Range, Dzonze Forest, 1750–1800 m, *Dowsett-Lemaire* 1079 (K); Mwanembu Mountain, *McClounie* 6 (K); S. region, Malosa Mountains (N. of Zomba), 1900 m, *Dowsett-Lemaire* 973 (K); Mount Mulanje, Tuchila Plateau, 6000 ft, *Newman & Whitemore* 214 (SRGH).

MOZAMBIQUE: Penhalonga Waterfall, *Chase* 3247 (NU, SRGH); Penhalonga Forest, *Chase* 3219 (SRGH).

RWANDA: Plantation Gasiza au N. de Ruhengeri au pied Ngahinga et du Muhavura, 2350 m, *Van der Veken* PV 10265 (B, BR); Kirunga Vulcan, 2500 m, *Poetsen* 81 (B); Dalinghi, *Zappelli* 262 (BR); Kissenyi, Sake, *Zappelli* 177 (BR); Chaîne des Birunga, pied SE du Gahinga, 2500 m, *Lambinon* 74/1534 (BR).

SOUTH AFRICA. 2329 (Pietersburg): Louis Trichardt, Hanglip Forest Station (BB), *Roux* 2572 (NBG); Louis Trichardt, Zoutpansberg Süds, farm Rustfontein, *c.* 1400 m, *Schlieben* 7342 (BR); Tzaneen, Dap Naude Dam, Woodbush (DD), *Burrows* 3269 (BOL, PRE). **2330 (Tzaneen)**: Duiwelskloof, Westfalia Estate (CA), *Scheepers* 419 (PRE); De Hoek Forest Station (CC), *Roux* 2563 (NBG); Woodbush Forest Reserve, Grootbos, *Roux* 2564, 2570 (NBG); Magoebaskloof near De Hoek Forest Station, *Van Jaarsveld* 6093A (BOL, NBG); Woodbush, *Jenkins* s.n. TM 919c (PRE); Woodbush, *Wager* s.n. CH7464 (PRE); Woodbush, *Reynolds* s.n. CH10246 (PRE); De Hoek, *Schweickerdt* s.n. (NBG, PRE); Pietersburg, Woodbush, *Schelpe* 6050 (BOL). **2430 (Pilgrim's Rest)**: Mariepskop, base of Klaserie Waterfall (DB); *Burrows* 3113 (BOL, PRE); Mount Sheba Nature Reserve (DC), *Roux* 2556 (NBG); Mount Sheba, *Kluge* 2320 (NBG); Mount Sheba Nature Reserve, *Jacobsen* 4420, 4428 (PRE); Ohrigstad Nature Reserve, *Jacobsen* 1413 (PRE); Pilgrims Rest (DD), *Collins* s.n. TM895c (PRE); Graskop, Blyde River Forest Reserve, *Jacobsen* 4363 (PRE). **2530 (Lydenburg)**: Lydenburg, Coromandel farm (AD), *Roux & Burrows* 13 (BOL); Coromandel farm, *Burrows* 1309 (BOL); Sabie, Tweefontein (BB), *Wager* 48 (PRE); Sabie Gorge, *Wager* 25 (PRE); Sudwala Caves, forest 2 km N. of caves, 1500 m (BC), *Kluge* 2465 (PRE); Sudwala Caves, *Burrows* 3193 (BOL); Nelspruit, Witklip Staatsbos (BD), *Kluge* 853 (PRE); Kaapsehoop (DB), *Wager* s.n. TM149c (PRE); Lydenburg, Clivia Pass (DD), *Edwards* 1149 (NU). **2531 (Komatipoort)**: Lomati falls and kloof behind Barberton (CC), *Wager* 151 (PRE); Barberton, *Williams* 104 (P); Baberton, *Thorncroft* 104 (GRA). **2630 (Carolina)**: Marieriestad (CA), *Pott-Leendertz* 4848 (BOL, PRE). **2730 (Vryheid)**: Piet Retief-Wakkerstroom road, 6 km from turnoff to Lüneburg (AD), *Roux* 2269 (NBG); Wakkerstroom, Oshoek, *Devenish* 2 (PRE). **2828 (Bethlehem)**: Royal Natal National Park, Goodoo Forest (DB), *Doidge* s.n. (PRE); Tugela Valley, *Hafström & Acocks* 1970 (PRE); Royal Natal National Park, Devils Hoek, 5000 ft, *Schelpe* 7973 (BOL). **2829 (Harrismith)**: Van Reenens Pass (AD), *Rehmann* 7205 (B, P); Oliviershoek Pass, Begonia Falls (CA), *Roux* 2514 (NBG); Qualeni Valley, 800 ft (CC), *Schelpe* 7270 (NU, PRE). **2929 (Underberg)**: Cathedral Peak Forest Research Station, 6050 ft (AB), *Killick* 1134 (PRE); Lions River, Lions Bush (BD), *Moll* 829 (PRE). **2930 (Pietermaritzburg)**: Lidgetton (AC), *Mogg* CH1764 (PRE); Lions River District, Karkloof, 'Braco', 4300 ft, *Schelpe* 5119 (BOL); Lidgetton, *Roberts* 871 (PRE); Zwaartkop (CB), *Sim* s.n. PRE-9045 (PRE); Zwaartkop, 4500 ft, *Sim* s.n. (NU); Pietermaritzburg, Ferncliff Nature Reserve, *Crouch* 593 (NU). **3029 (Kokstad)**: Kokstad (CB), *McLoughlin* 753 (BOL). **3127 (Lady Frere)**: Cala (DA), *Young* 511 (PRE); Engcobo (DB), *McLoughlin* s.n. CH7677 (PRE). **3128 (Umtata)**: Maclear, farm Woodcliffs (AB), *Roux* 2482 (NBG). **3129 (Port St Johns)**: Port St Johns (DA), *Wager* s.n. CH2905 (PRE). **3226 (Fort Beaufort)**: Katberg Forest Reserve (BC), *Roux* 2700 (NBG); Hogsback Forest Reserve, Fern Walk, 800 m (DB), *Dahltrand* 1853

(PRE); Hogsback, Zingcuka Forest, *Roux* 2414 (NBG). **3227 (Stutterheim)**: Stutterheim, Isidinge Forest (CA), *Roux* 1982 (NBG); Keiskamma Hoek, *Ely* 526 (PRE); Cathcart, Fort Cunnyngham Forest Reserve (CB), *Roux* 2431 (NBG); Pirie, *Sim* s.n. TM514 (PRE); Kingwilliamstown, Pirie Forest along Amatola trail, *Roux* 2708 (NBG). **3325 (Port Elizabeth)**: Johana Kloof (BC), *Breutel* s.n. (L). **3419 (Caledon)**: Riviersonderend, farm 'Oubos' (BB), *Roux* 2585 (NBG).

SUDAN: Gilo, Imatong Mountains, Ngairigi River, 5000 ft, *McLeay* 455 (K).

TANZANIA: Station Kyimbila, Fundort Rungwe, 1300 m, *Stolz* 889 (B, L, P, S, WAG); Kilimanjaro, environs de Kibosho, 2500 m, *Daubenberger* s.n. PRE-6788 (PRE); Kilimanjaro, Kibosho, 2000–4000 m, *Daubenberger* 35 (B, BR, P, PRE, S); Mt. Meru, NE end of the caldeira wall, *c.* 8500 ft, *Greenway & Fitzgerald* 13613 (K, PRE); Kilimanjaro-Süd, *c.* 1900 m, *Schlieben* 4596 (BOL, BR, PRE, SRGH); region de Kilimanjaro, environs de Kibosho, Kilema-Machame, *Daubenberger* s.n. (BR, P); Kilimanjaro, 2800 m, *Alluaud* 310 (P); British East-Africa, forêts de Lamoru, *Le Petit* s.n. (P); forêts de plateau Kikuyu, 2000 m, *Le Petit* s.n. (P); Usambara Mountains, Mahali Mountains, 6000 ft, *Newbould & Jefford* 1731 (K); Morogoro, *Glover* 268 (K); Marangu, SE Kilimanjaro, 4600 ft, *Beesley* 14 (K); Mbeya District, Kikondo camp, Poroto Mountains, 1950 m, *Richards* 13972 (B, BR, K); Moshi District, Kilimanjaro, *c.* 1900 m, *Schlieben* 4596 (K); Arumeru District, banks of Engare Olmotonyi River, *c.* 4 km N. of Olmotonyi Forestry Institute, *Mtui* 143 (K); Mount Meru, Engarenanyuki, 7600 ft, *Vesey-FitzGerald* 3031 (K); Mbeya District, Mount Kikondo, 6500 ft, *M.R.* 13972 (K); Mount Meru, end of Olmotonyi, *Schippers* T778 (WAG); Mount Meru, 2090 m, *Schippers* T729 (WAG); South Pare Mountains, Mugambo Forest Reserve, 1480 m, *Schippers* T951 (WAG); W. Usambara Mountains, on hill above Shume Forest Meteorological Station, 2050 m, *Schippers* T1506 (WAG); Kilimanjaro, oberhalb Marangu, *Volkens* 1266 (B); Kilimanjaro, 1900 m, *Schlieben* 4596 (B); Usambara, Lutindi, *Liebush* s.n. (B); Kondoa-Frangi, Ndiomeberg, 1800 m, *Ledemann* s.n. (S); Kilimanjaro, above Marungu, 2000 m, *Pedersen* 527 (BR); Morogoro Mountains, 2300 m, *Chisongela* 9 (BR).

UGANDA: near Luhiza-Kigezi, 7000 ft, *Rose* 10311 & 10312 (K); forest near Mt. Debasien, 6000 ft, *Eggeling* 2683 (K); Ruwenzori Mountains, 7000 ft, *Hazel* 114 (K); Luhiza-Kigezi, 7000 ft, *Rose* 10299B (K).

ZAMBIA: Nyika Plateau, Chowe Forest, 2100 m, *Dowsett-Lemaire* 220 (K).

ZIMBABWE: near Umtali, *Holland* s.n. (NBG); Vumba Mountains, near Umtali, 6000 ft, *Obermeyer* 2099 (K, PRE); Melsetter, Bridal Veil Falls, *Jacobsen* 3087 (PRE); Melsetter, in gulley border of 'Skyline' & 'Thornton' areas, *Chase* 7482 (BOL, K); Umtali, Banti south, 5800 ft, *Jacobsen* 3864, 3879 (SRGH); Inyanga, above Pungwe rest hut 2, 5300 ft, *Chase* 5655 (BOL, PRE, SRGH); Melsetter, Musapa mountain, *Grosvenor* 264 (BOL, SRGH); Melsetter, Gwendingwe, *Müller* 2880 (SRGH); Umtali District, Cashel, Black Mountain Inn, *Chase* 4021 (NU); Melsetter District, Bridal Veil Falls, *Chase* 4020 (NU); Inyanga, *Patterson* 24 (GRA); Inyanga, Pungwe Rest Huts, 5300 ft, *Schelpe* 5679 (BOL).

WITHOUT EXACT LOCALITY: Natal, *Tyson* s.n. CH2168 (PRE); Natal, *Gerrard* 1931 (P); Zululand, *Gerrard & McKen* s.n. (P); Zimbabwe, *Wild* 1470 (K); loco incerto, *Mann* 2067 – pro parte (K); near Bamenda, 7500 ft, *Migeod* 383 (K); Natal, *sine coll.* s.n. (NBG); Natal, *Buchanan* 27 (B-only) (M); Natal, *Plant* 328 (B); Natal, *Buchanan* 75 (B); loco incerto, *Bergius* s.n. (B); Rebfall bei Gaffat, *Haidner* s.n. (B, S); Kissenye, Ninagongo, 2500–2900 m, *Mildbraed* 1341 (B); loco incerto, *Holst* 3837 (B); loco incerto, *Sim* s.n. CH4171 (PRE); Gold Fields, *Ayres* s.n. (NH); Burungo, *De Witte* 1472 (BR); Natal, *Holub* s.n. (BR); Kikuku, 1750 m, *Ban* 367 (BR); Natal, *Buchanan* s.n. (BOL).

Polystichum transvaalense and *P. wilsonii* are often confused. Pichi Sermolli (1977, 1985) ascribed material of *P. transvaalense* to *P. fuscopaleaceum* Alston var. *fuscopaleaceum,* while Schelpe (1967, 1970, in part) and Jacobsen (1978) ascribed material of this species to *P. setiferum* var. *fuscopaleaceum* (Alston) Schelpe. Jacobsen & Jacobsen (1989), however, considered *P. fuscopaleaceum* and *P. transvaalense* to be conspecific.

Aware that two forms exist, Schelpe (1967) concluded that no clear differentiation at the specific level was possible and considered plants with dark stipe base paleae as *P. setiferum* var. *fuscopaleaceum.* This classification was largely followed by Jacobsen (1978), although he considered the high elevation collections a Drakensberg form. Although he ascribed several collections to this form he refrained from giving it any formal taxonomic status. Pichi Sermolli (1977), however, considered *P. fuscopaleaceum* distinct from *P. setiferum.* He also recognized two 'altitudinal vicariants' with *P. fuscopaleaceum* var. *fuscopaleaceum* occurring at lower elevations than *P. fuscopaleaceum* var. *ruwensoriense*, a subdivision he retained in 1985. I consider the two groups sufficiently distinct to warrant specific status, a conclusion supported by the discovery of a sterile hybrid between these putative parents.

DIAGNOSTIC FEATURES AND RELATIONSHIPS. Diagnostic of *Polystichum transvaalense* is its confinement to moist forests, the presence of up to 17 caespitosely arranged, suberect to arching fronds that may reach a length of up to 1.045 m on a short erect to suberect rhizome, the stipe, rachis and pinna-rachises bearing mostly ferrugineous, twisted and somewhat shrivelled, proximally lacerate paleae terminating in an acicular cell, and the mostly fimbriated but often erose and rarely repand indusium. The perispore is highly porate.

Polystichum transvaalense appears to be most similar morphologically to *P. wilsonii* H. Christ; the two belong to section *Lasiopolystichum.* An analysis of the differences between these species is provided under *P. wilsonii.*

VARIATION. *Polystichum transvaalense* shows considerable variation in the length of the frond, stipe, lamina and basal pinna (Table 2). This may be ascribed to the diverse altitudes, climates and vegetation types it occupies throughout its broad range. The species, however, shows little variation in pinnule outline and palea structure, distribution and density. Stipe-base paleae are mostly ferrugineous, but in rare cases the larger paleae are densely impregnated with secondary compounds giving them a dark brown colour. The indusium also shows significant variation in size, shape and the presence or absence of central processes. Basal pinnae may be deflexed or not. Possible causes of these variations in plants occurring in close proximity under similar growing conditions remain unknown.

Table 2 Variation in frond, stipe lamina and basal pinna length in *Polystichum transvaalense* N.C. Anthony.

	Ramge (mm)	x (±S.D.)	n
Frond	212–1045	713.9 (204.1)	41
Stipe	77–535	283.3 (101.6)	42
Lamina	135–670	422 (116.1)	52
Pinna	25–140	86.3 (27.2)	52

DISTRIBUTION AND ECOLOGY. *Polystichum transvaalense* is widely distributed in temperate and tropical Africa. The distribution largely follows the escarpment and mountain ranges on the eastern parts of the continent. In South Africa it occurs from the Drakensberg foothills in the Eastern Cape along the KwaZulu-Natal Drakensberg escarpment, the Eastern Cape and southern KwaZulu-Natal midlands, the Free State-KwaZulu-Natal and Mpumalanga-Northern Province escarpments to the Soutpansberg in the Northern Province. A single collection is also known from the foothills of the Riviersonderend Mountains in the southern Cape. In Zimbabwe it is found in the Chimanimani and Vumba Mountains extending to the Zomba Plateau, the Kirk Mountains and the Nyika Plateau in Malawi and Zambia. In Tanzania it occupies the Uluguru- and

Usambara Mountains, Mt. Meru and Mt. Kilimanjaro. Further north it occurs in the mountainous areas of Kenya, Uganda, Ethiopia, the Imatong Mountains in Sudan and the Kivu Ridge in the Democratic Republic of Congo. A disjunction in this pattern arise in that *P. transvaalense* is also found on Mt. Cameroon and Bioko in the Gulf of Guinea.

The lithology, climate and vegetation associated with *Polystichum transvaalense* varies considerably throughout its range. In the southern Cape it occupies isolated forest patches in Mesic Mountain Fynbos (Moll et al., 1984) at *c.* 365 m in acidic sandy soils and on rocks of the Table Mountain Sandstone formation. *Polystichum transvaalense* is an exclusively forest growing species, generally growing as individuals on streambanks or on rocks along streams but rarely also as low-level epiphytes. *Polystichum transvaalense* occurs in several forest types as defined by Acocks (1988). In the Eastern Cape it is found in Pondoland Coastal Plateau Sourveld forests and rarely in Typical Coast-belt forests. In the Natal midlands and Drakensberg escarpment where it may appear at elevations up to 1840 m it occurs in 'Ngongoni Veld forests and Highland Sourveld forests. In Mpumalanga these forests are replaced by Northeastern Mountain Sourveld forests that extend to the Soutpansberg. North of the Limpopo the species is found at elevations ranging between 1300 and 2825 m in largely Undifferentiated Afromontane forests, as defined by White (1983), but often also in single-dominant Afromontane forests such as *Juniperus procera* forests at 2400 m in Ethiopia and in Afromontane bamboo at 1828 m on Mt. Malati in Tanzania and at 2745 m at Kinangop in Kenya.

8. **Polystichum wilsonii** H. Christ in *Bot. Gaz.* **51**: 353 (1911). Type: China, Szechuan Province, Mupin, woodlands, 4000–6000 ft, *Wilson* 2614 (BM!-holotype).

Fig. 9.

Polystichum lobatum var. *ruwensoriense* Pirotta in L.A. di Savoia, *Il Ruwensori* **I**: 478 (1909). Type: Ruwenzori, nella foresta scendendo da Kichuchu a Nakitava, *Roccati et Cavalli-Molinelli* s.n. (TO-holotype).

Polystichum aculeatum var. *mildbraedii* Brause in *Bot. Jahrb. Syst.* **53**: 379 (1915). Type: Fernando Po (Bioko), Nordseite des Pics Sta. Isabel oberhalb Basilé, Grasflur-Region des Gipfels mit viel *Ericinella*, zwischen Gras, *c.* 2700 m, *Mildbraed* 7180 (B!-holotype).

Polystichum aculeatum var. *rubescens* Bonap., *Notes Ptérid.* **14**: 214 (1923). Type: Tanzania, Kilimanjaro, zone supér des forêts, 2760 m, *Alluaud* 48 (P!-holotype).

Polystichum aculeatum var. *stenophyllon* Bonap., *Notes Ptérid.* **14**: 215 (1923). Type: Kenya, Mont Kênya, versant ouest, forêt inférieure, 2400 m, *Alluaud* 241 (P!-holotype).

Polystichum fuscopaleaceum Alston in *Bol. Soc. Brot.* sér. 2, **30**: 22 (1956). Type: Cameroon, Victoria District, Cameroon Mountain, SW of hut 2, in gully woodland, 9100 ft, *Keay* FHI 28602 (BM!-holotype).

Polystichum setiferum var. *fuscopaleaceum* (Alston) Schelpe in *Bol. Soc. Brot.* sér. 2, **41**: 216 (1967).

Polystichum fuscopaleaceum var. *ruwensoriense* (Pirotta) Pic.Serm. in Webbia **32**: 90 (1977).

Polystichum alticola Schelpe & N.C. Anthony in *Contr. Bolus Herb.* **10**: 144 (1982). Type: South Africa, Ladismith, Swartberg, Toverkop, 2160 m, *Esterhuysen* 26699 (BOL!-holotype; NBG!, PRE!, isotypes).

Plants terrestrial or epilithic. *Rhizome* short, to 130 mm long, erect to suberect, to 10 mm in diameter, rarely branched, set with roots, crowded, persistent stipe bases, and paleae; paleae broadly attached, castaneous, chartaceous, narrowly linear, the margins with small, widely spaced cellular outgrowths, the apex mostly terminating in an acicular cell, rarely in a small thin-walled cell, to 12 × 1 mm. *Fronds* caespitose, 8–12 per plant, suberect to arching, to 1.05 m long; *stipe* proximally castaneous, stramineous distally, adaxially sulcate, to 450 mm long × 5 mm in diameter, sparsely to densely paleated; larger paleae broadly attached, often slightly bullate, spreading, extending to the rachis, concolorous or bicolorous, chartaceous to crustaceous, broadly ovate-acuminate to ovate-acuminate, cordate to cordate-imbricate, the margins widely to closely fimbriate, fimbriae generally straight, the apex entire, terminating in an acicular cell, to 23 × 9 mm; smaller paleae apically or basally directed, stramineous, chartaceous, narrowly triangular to subulate, short-stalked, often somewhat auricled, the margins proximally with long straight, angular or curved outgrowths, distally with few widely spaced, short or long marginal outgrowths, the apex entire, terminating in an acicular cell, to 13 × 7 mm: *lamina* 2-pinnate, with up to 29 free pinna pairs, herbaceous to firmly herbaceous, pale to dark green adaxially, paler abaxially, narrowly elliptic, to 625 mm long, the proximal pinnae reduced, deflexed: *rachis* stramineous, adaxially sulcate, densely set with paleae similar to but smaller than those on the stipe, paleae restricted to the abaxial surface, to 9 × 3 mm: *pinnae* 1-pinnate, with up to 12 free pinnule pairs, proximally widely spaced, distally closely spaced and somewhat overlapping, folded ventrally along the rachis (conduplicate), narrowly triangular to oblong-attenuate, the proximal pinnae to 88 mm long × 20 mm wide: *pinna-rachis* stramineous, adaxially sulcate, densely paleated; paleae short-stalked, narrowly ovate to narrowly triangular, the margins proximally with long straight or angular outgrowths, apically with few widely spaced short or long outgrowths, the apex entire, terminating in an acicular cell: *pinnules* asymmetric, acroscopically auriculate, narrowly trullate to trullate, to 12 mm long, serrate, long-aristate; adaxially with straight or slightly twisted filiform paleae, simple or proximally with short straight or curved marginal outgrowths, the apex terminating in an acicular cell; abaxially with straight or proximally somewhat twisted, subulate-hastate paleae, the margins with short straight or angular outgrowths at the base, the apex entire, terminating in an acicular cell. *Venation* raised. *Sori* circular, *c.* 1 mm in diameter, terminal or near terminal on abbreviated vein branches: *sporangium* with 11–(15)–24 indurated annulus cells; stalk eglandular: *indusium* stramineous, peltate, circular or reniform, repand to erose, often with small central processes, persistent, the maximum radius 0.51–(0.75)–1.09 mm. *Spores* 64 per sporangium, brown, the perispore smooth or tuberculate, spiculate, closely perforated, the exospore 32–(41.74)–52 × 24–(30.16)–40 µm. *Chromosome number* 2n=164.

MATERIAL EXAMINED

BIOKO: Fernando Po, *Mann* s.n. (K); cratera del pico Basilé, km 23, junto a la cumbre, 3000 m, *Carvalho* 3652 (B, BR).

CAMEROON: Mt. Cameroon, 3700 m, *Breteler* et al. 69 (K, P, WAG); Mt. Cameroon, 1950 m, *Breteler* et al. 75 (K, P, WAG); Bambutos, 2600 m, *Félix* 5430 (P); Mt. Cameroon, 3600 m, *Annet* 126 (P); Cameroon, mont versant, 3000 ft, *Meurillon* 1158 (BR, K, P); piste du village d'Okon au mert Okon, 3008 m (45 km SSO de Nkambé), *Letouzey* 8940 (K, P); Mt. Cameroon, haut plateau, 3600 m, *Annet* 128 (P); Bambutos, station mi-ombrageé, vers 2300 m, *sine coll.* 30 (P); Mt. Cameroon, 7–10000 ft, *Mann* 1376 (K); Cameroon Mountain, above 2nd hut, 12000 ft, *Hutchinson & Metcalfe* 48 (K); Mt. Cameroon, 11000 ft, *Steele* 22, 27 (K); Mt. Cameroon, 11000 ft, *Migeod* 190 (K); Mt. Cameroon, oberhalb Buea, 2800 m, *Mildbraed* 10883 (B, K); Buea, 3000 m, *Preuss* 787 (B), 788 (B, S); Kamerun-Berg, standort über Buea, unteren Fako Plateau, 2800 m, *Mildbraed* 3377 (B); Kamerungebirge, Buea, *Deistel* s.n. (B); Kamerun-pitz, 3500–3600 m, *Bornmüller* 26 (B); Mt. Cameroon, 3800 m, *Hintz* 29 (B); Buea, Wonjombia faco, *Reder* 1026 (B).

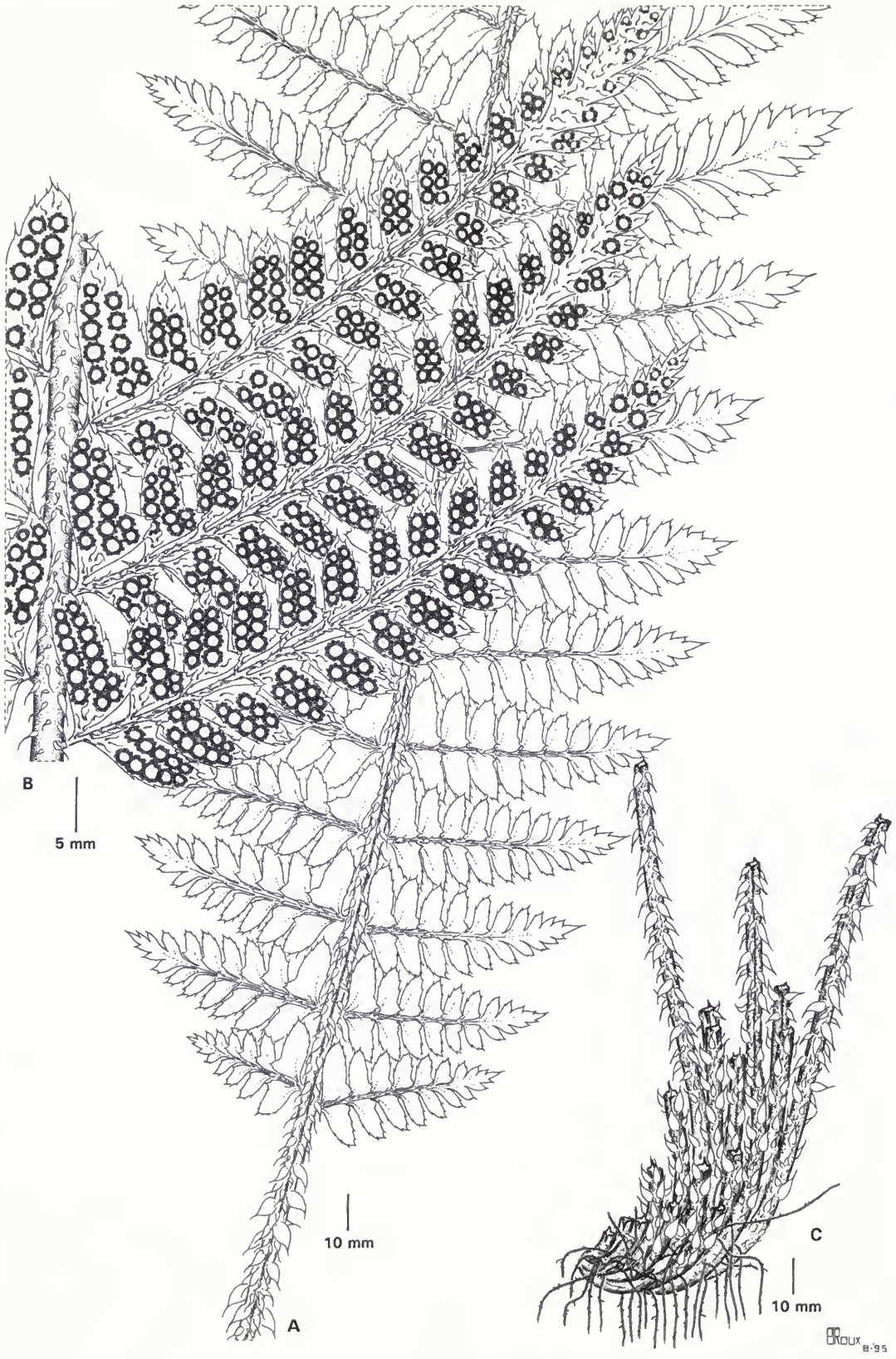

Fig. 9 *Polystichum wilsonii*. A, proximal part of lamina; B, rhizome; C, adaxial surface of pinnule; D, abaxial surface of fertile pinnule. All drawn from *Roux* 2529 (NBG).

DEMOCRATIC REPUBLIC OF CONGO: Kivu District, Virunga west, Nyamuragira, *Stauffler* 178 (BR, PRE); P.N.A. Kabara, flanc N. du volcan Karisimbi, 3000 m, *Jean Louis* 5301 (BR, K, P); Volcan Karisimbi (au NE du lac Kivu), 3500 m, *Humbert* 8563 (BR, P); Kivu, Volcan Mikeno, 2500–3400 m, *Humbert* 8010 (BR, P); Mt. Kinangop, 2800 m, *Alluaud* 262 (P, S); P.N.A. Nyamlagira, 3000 m, *Germain* 3476 (BR); Kivu District, SW side of Mt. Mikeno, 10500 ft, *Chaplin* 373 (BR); 1°29′S, 29°26′E, Goma territory, versant ouest du Karisimbi, 3360 m, *Bamps* 2984, 2995 (BR); Parc National Albert, ruisseau affl. de la Nososa, (a l'est de Mahungu), 3180 m, *Fredericq* 9152 (BR); Viroenga Park, Karisimbi-massif, 3465 m, *Van der Veken* 9130, 9135 (BR); Kivu, upper Ruamoli Valley, 1180 ft, *Ross* 778 (BR); Viroenga Park, Karisimbi-massif, ±3 km van de gîte Rukumi, ±3330 m, *Van der Veken* 9140 (BR); massif du Karisimbi, à 500 m env. du gîte de Rukumi, 3500 m, *Auquier* 2290 (BR); Kivu Province, upper Ruamoli Valley, 12 500 ft, *Ross* 743 (BR); Parc National Albert, selle de Kabora entre le Karisimbi et le Mikeno, 3000–3100 m, *Lebrun* 7344 (BR).

ETHIOPIA: Bale Region, 45 km N. of Goba, Sannetti Plateau, 3900 m, *Tadesse* 5545 (ETH); SE of Dinsho on road from Goba to Shashemene near proposed HQ of Bale National Park, 10400 ft, *Gilbert* 1812 (ETH, K); Bale Province, Bale Mountain National Park, E. of Garba Goracha camp, 4070 m, *Hedberg* 5649 (ETH); pass just N. of the summit of Cara Mulatta Mountain, *c.* 10200 ft, *Burger* 1480 (ETH); Choké Mountain, Gojjam, vicinity of the upper Ghiedeb Valley, *Flenley & Evans* 327 (ETH, K), Begemdir Province Simien, Buahit, 3870 m, *Hedberg & Aweke* 5461 (ETH); Bale Mountains, Finchaya Habera, 3510 m, *Miehe* 266, 335 (ETH); Bale Mountains, above Goba, 3500 m, *Miehe* 3086 (ETH); Bale Mountains, above Rira, 3530 m, *Miehe* 2343 (ETH); Shoa Province, Arussi Mountains, 35 km S. of Mount Chillalo 32 km on track to Ticcio via Robie turnoff, 35 km S. of Asella, 3275 m, *Ash* 2330 (ETH); Bale region, Mendeyou Auraja, *c.* 5–7 km on Fincha Haberra-Soddota track, 3500–3580 m, *Tadesse* 7813 (ETH); Shoa, Lake Wonchi, outer rim of caldeira, *Gilbert & Tewolde* 3279 (ETH, K); Bale region, Mendeyou Awraja Fincha Heberra, 3490–3510 m, *Tadesse* 7713 (ETH); in rupibus umbrosis Demeski, 10500 ft, *Schimper* 244 (P); Matssehe Dedschem, 12000 ft, *Schimper* 1398 (P); Arussi Prov., Chillalo Awraja, Galama Mountains (30 km ESE of Asella) *c.* 3 km E. of Boraluco, 3750 m, *Hedberg* 4233 (K, PIC.SERM.); Bale region, Dello Awraja, *c.* 3.7 km N. of Kecha towards Rira, 2620 m, *Tadesse* 5143 (ETH); Shewa region, Wonchi Mountains, edge of volcanic crater 20 km to SSE of Ambo, *Pavlov & Petelin* 138 (ETH); in regio media montis, *Schimper* 180 (B, K, P, S); Begemder Province, Semian Mountains, *De Wilde* 175 (BR, WAG); Mt. Borullccu, along road to Ticco *c.* 30 km SE of Asella, *c.* 4000 m, *De Wilde* 9039 (WAG); *c.* 25 km SE of Asella, W. slope of Mt. Boruluccu, *c.* 3800 m, *De Wilde* 8089 (WAG); *c.* 3 km E. of Asella, *c.* 175 km SSE of Addis Ababa, W. slope of Mt. Cilalo, *c.* 2700 m, *De Wilde* 6623 (BR, WAG); Shoa Province, Menagesha State Forest on the W. slope of Mt. Wuchacha, 2600 m, *Friis* 1209 (K); *c.* 175 km from Addis Abeba on Dessie road, 10500 ft, *Gilbert* 454 (K); Bale region, 10–15 km SE of Goba on road towards Masslo, 3200–3400 m, *Thulin* 3678 (K); Gara Mullato Mountains, 10800 ft, *Burger* 1907 (K); Scioa, Monte Wochacha, 3250–3300 m, *Pichi Sermolli* 6740 (B, BR, K); Mussolini Pass, between Dera Sina and Debra Berhan, *c.* 3000 m, *De Wilde* 9654 (WAG); Ethiopia, *Schimper* 1398 (B); ad rupes locis humidis umbrosis pr. Demerts, 10500 ft, *Schimper* 244 (B); Arussi, Catena dei Monti Galamo-Sagatu, *c.* 3100 m, *Pichi Sermolli* 6828 (BR).

KENYA: Mt. Kenya, forest end, 9600 ft, *McLoughlin* 676 (BOL, PRE); Mt. Elgon, versant est, *Arambourg* et al. 134, pro parte (P); W. slopes of Mt. Kenya, along the trail from West Kenya Forest Station to summit, *c.* 3630 m, *Mearns* 1421, 1502, (P); W. slopes of Mount Kenya, along trail from West Kenya Forest Station to summit, *c.* 3000 m, *Mearns* 1702 (B, P, S); Mt. Kenya, *c.* 7500 ft, *Schippers* K164 (WAG); Aberdares National Park, *c.* 10500 ft, *Schippers* K110 (WAG); Aberdares National Park, *c.* 10300 ft, *Schippers* K78 (WAG); Shira Plateau, W. Kilimanjaro, 3200 m, *Schippers* T1052 (WAG); Mt. Meru, *c.* 2000 m, *Schippers* T777 (WAG); Mt. Kenya, Kinangop, Aberdare, 8800–8900 ft, *Chandler* 2266 (K); Aberdare Mountains, *James* s.n. (K); Aberdare Mountains, *Ramsden* s.n. (K); Aberdare range, near W. part of the Nyeri track, 3100 m, *Hedberg* 1533 (K); near Molo, Mau Forest, 8000 ft, *Gardner* 975 (K); Narok District, 20 miles from Olokurto on road to Elburgon, *c.* 9600 ft, *Glover* et al. 1096 (K); SE Aberdares, Kitikuya, 8500 ft, *Gardner* s.n. (K); Rift Valley, Nakuru District, E. Mau Forest Reserve, 2750 m, *Geesteranus* 5908 (BR, K, L, PRE, S); Mt. Elgon, E. slope above Tweedie's saw-mill, 2550 m, *Hedberg* 68 (K, S); North Forest, 9200 ft, *Schippers* K364 (WAG); Mt. Aberdare, *c.* 3200 m, *Fries* 2644 (B); Mt. Elgon, 2700 m, *Gravik* s.n. (S); Mt. Elgon, 3800 m, *Gravik* s.n. (S); Mt. Kenya, Sagana Valley, 10500 ft, *Schelpe* 2713 (BR); Mt. Aberdare, pr. 'West Kenya Forest Station', 2350 m, *Fries* 775 (BR); Mt. Kenya, 10000 ft, *Meyerscough* K2, K3, K16, K18, K22, K26, K30, K31 (BOL).

LESOTHO. 2828 (Bethlehem): Butha Buthe District, Khatibe B camp, 9500 ft (DC), *Troughton* B26 (GRA); Leribe, *Dieterlen* 167 (BOL, P, pro parte); 1 km from Moteng store, *Roux* 1294 (NBG). **2927 (Maseru)**: between Blue Mountain Pass and Likholaneng, 8700 ft (BD), *Schmitz* 7266 (PRE); Morija, *Dieterlen* 1309 B-only (PRE). **2928 (Marakabei)**: Mamalapi, 8000 ft (AC), *Jacot-Guillarmod* 690 (PRE); Mamalapi, 9000 ft, *Compton* 21331, 21334, 21339 (NBG); hill at Bushmen Pass, beyond little Bokong, 9000 ft, *Bevis* 102 (PRE); Blue Mountain Pass, *Roux* 2227 (NBG); mountain road, 60 miles from Maseru, 8000 ft, *Bowmaker* 23 (BOL); mountain road, 38 miles from Maseru, 7500 ft, *Bowmaker* 25 (BOL); Lehaha-la-Sekhomgana, 9100 ft (AD), *Jacot-Guillarmod* 206 (PRE); Semonkong, waterfall gorge, *c.* 7000 ft (CC), *Davidson* 3023 (PRE); Semonkong, at Le Bihan Waterfall, *Roux* 1493 (NBG). **2929 (Underberg)**: Between Mokhotlong and Sani top, ± 15 km from Mokhotlong, 2200 m (AC), *Matthews* 887 (NBG, PRE); ± 15 km past Thaba-Tseka turnoff on Sani road, *Roux* 1344 (NBG); Sehlabathebe National Park (CC), *Schmitz* 7122 (PRE); Sehlabathebe National Park, *Matthews* 987 (NBG); Sehlabathebe area, on way to Devils Knuckles, 9500 ft, *Davis* 181 (NU); Sehlabathebe area, Devils Knuckles, *c.* 9000 ft, *Davis* 176 (NU); Sehlabathebe National Park, 2250 m, *Hoener* 1658 (BOL).

SOUTH AFRICA. 2730 (Vryheid): Wakkerstroom, Oshoek, 6400 ft, (AD), *Devenish* 195, 638 (PRE). **2731 (Louwsburg)**: Nongoma, *c.* 1000 ft (DC), *Tosh* s.n. (NU). **2828 (Bethlehem)**: Clarence (CB), *Van Hoepen* s.n. TM18230 (PRE); gully between the Witches and the Sentinel (DB), *Roux* 1906, 2529 (NBG); versant N. du Mont-aux-Sources, région de Witzies Hoek, *c.* 1800 m, *Junod* 14 (P); Royal Natal National Park (DB), *Hafström & Acocks* 1699 (PRE); Royal Natal National Park, Gudu Forest, *Roux* 2510a, 2511 (NBG); Mont-aux-Sources, 8000 ft (DD), *Dyke* 5489a (NBG); Royal Natal National Park, Plowmans Kop, *Aerck* 1966 (S); Mont-aux-Sources, 10000 ft, *Sim* s.n. TM521c (PRE); Mont-aux-Sources, *Mogg* 4222 (PRE); Mont-aux-Sources, 3100 ft, *Marloth* 2862 (BOL). **2829 (Harrismith)**: Harrismith, Platberg, Zig-Zag Pass, 1800 m (AC), *Jacobsz* 4715 (PRE); Harrismith, Platberg, Donkie Pass, 1850 m, *Jacobsz* 4729, 4730 (PRE); Platberg, 6800 ft, *Roux* 782 (NBG); Harrismith, Platberg, *Roux* 2521, 2524, 2526 (NBG); Harrismith, farm Bosch Hoek (AD), *Roux* 892 (NBG); Harrismith District, farm Klavervlei (CA), *Roux* 876 (NBG); Oliviershoek Pass, S. of Seheletwane, *Roux* 2516, 2517 (NBG); MnWeni Pass, 8000–9000 ft (CB), *Esterhuysen* 27838 (BOL); MnWeni area, Pinnacles Gully, 9000 ft, *Esterhuysen* 29595 (BOL); MnWeni area, Mbunduni scree, *c.* 6000 ft, *Esterhuysen* 27816 (BOL); Drakensberg, Injasuti area, 6500–8500 ft (CC), *Esterhuysen* 26045 (BOL, K, NBG, PRE); along Cathedral Peak path, 1550 ft, *Goetghebeur* 4571 (BR, PRE); Cathedral Peak, *Ruch* 2030, 2300 (PRE); Cathedral Peak area, 5000 ft, *Harding* 38 (NU); Cathedral Peak Forest, *Killick* 981 (NU). **2929 (Underberg)**: Cathedral Peak Forest Research Station, 6100 ft (AB), *Killick* 981 (PRE); summit of Cathedral Peak, 7700 ft, *Schelpe* p.30 (NU); Cathedral Peak area, Cleft Peak path, 8000 ft, *Schelpe* 557 (NU); upper Tsanatalana Valley, near Cleft Peak, 9800 ft, *Schelpe* 7227 (BOL); Champagne Castle, *Bayer* 1443 (PRE), 1445 (NU, PRE); Giants Castle (AD), *Symons* 134 (PRE); Mpendhle Distr., Mulangane Ridge, above Carter's Nek, 7000–7300 ft (BC), *Hilliard & Burtt* 16951 (BOL, NU), 16969 (BOL, NU, PRE); Mpendhle District, Highmoor Forest Reserve, ridge SE of Giants Castle, headwaters of Elandshoek River, *c.* 8100 ft, *Hilliard & Burtt* 16192 (BOL, NU); near Rosetta, 5000 ft (BD), *Thode* s.n. (NBG); Drakensberg Garden State Forest Reserve, 9500 ft (CA), *Van Jaarsveld* 6531 (NBG); Garden Castle Forest Reserve, Mlambonya Valley, 6200 ft, *Hilliard & Burtt* 14972 (BOL, NU); upper tributaries S. of Mkomazi River (CB), *Hilliard & Burtt* 15853 (NU, PRE); Bamboo Mountain, *McClean* 684 (PRE); Sani Pass, wet slope below waterfall, 6900 ft, *Hilliard & Burtt* 17976 (NU, PRE), 17983 (BOL, NU, PRE); Sani escarpment, *c.* 9000 ft, *Marker* s.n. (GRA); Underberg District, 5–7 miles NNW of Castle View farm, headwaters of Mlahlangubo River, 8500 ft, *Hilliard & Burtt* 15331 (BOL, K, NU); headwaters of Mlahlangubo River, *c.* 7800 ft, *Hilliard & Burtt* 13714 (NU); Underberg District, Gxalingenwa Valley between Sani Pass and Polela Valley, 7400 ft, *Hilliard & Burtt* 17199 (BOL, NU); Ndumeni area (CC), *Everson* s.n. (BOL);

Bulwer (DD), *Allsopp* 850, A-only (NU); Bulwer, *Henkel* s.n., A-only (NU); Xumeni Forest, *Rycroft* 519 (NU). **2930 (Pietermaritzburg)**: Nottingham Road District, 'Drayton', 5400 ft (AC), *Smith* 147 (NU); York, 'Benuie', *c.* 4000 ft (AD), *Fisher* 1040 (NU); Impendhle, Boston, 4500 ft (CA), *Beattie* 77 (NU); Pietermaritzburg, Zwaartkop (CB), *Sim* s.n. (NU, PRE). **3027 (Lady Grey)**: Lady Grey, mountain left of summit of Jouberts Pass on road to Barkley East (CA), *Roux* 1136 (NBG); Wittebergen, Ben McDhui, 9550 ft (DB), *Galpin* 6934 (BOL, GRA, PRE), 6935, 6939 (BOL, PRE); road between Naude's Nek and Ben McDhui, *Roux* 1180 (NBG); Barkley East District, Ben McDhui, Bell River Gorge, *c.* 8000 ft, *Hilliard & Burtt* 16526 (BOL, K, NU); zwischen Passtrasse Maclear und Naude's Nek, *Werdermann & Oberdieck* 1118 (B); Barkley East District, Ben McDhui, 9550 ft, *Galpin* 6939 (B); Ben McDhui, *c.* 9000 ft, *Hilliard & Burtt* 16406 (BOL, NU); Ben McDhui, 8900 ft, *Hilliard & Burtt* 16495 (NU). **3028 (Matatiele)**: near summit of Ongeluks Nek Pass (AD), *Roux* 1383 (NBG); Rhodes, Naude's Nek Pass (CA), *Roux* 2475, 2477 (NBG). **3029 (Kokstad)**: upper slopes of Inungi Range, Matatiele, *c.* 5500 ft (CA), *Acocks* 12207 (PRE); Kokstad (CB), *McLoughlin* S38 (PRE); Mt Currie Nature Reserve, Kokstad, *Crouch* 511 (NU); Kokstad, *McLoughlin* 746, 753 (BOL). **3030 (Port Shepstone)**: Oribi Gorge (CB), *Slinger* 59 (NU). **3127(Lady Frere)**: Barkley Pass between Elliot and Barkly East (BB), *Roux* 2469 (NBG); Bastervoetpad, between Ugie and Barkley Pass, *Roux* 2471, 2474 (NBG). **3128 (Umtata)**: summit of Biziya Mountain, 1250 m (AD), *Stever* 898 (PRE). **3225 (Somerset East)**: near Somerset East (DA), *MacOwen* s.n. (P). **3226 (Fort Beaufort)**: Upper Zwart Kei, Mount Hope farm, 5300 ft (BC), *Galpin* 5621 (GRA, PRE); Katberg Pass summit, farm Pleasant View, *Roux* 2698 (NBG). **3319 (Worcester)**: Hex River mountains, shale band between Buffels Dome and Milner Peak, 5000 ft (AD), *Esterhuysen* 28708 (BOL, NU, PRE); Roodeberg (Matroosberg group), 6000 ft (BC), *Esterhuysen* 27695a (BOL); Worcester Division, shale band below Milner Peak, 5000 ft (CB), *Esterhuysen* 14885 (PRE); Hex River Mountains, Moraine kloof, 4000 ft (DD), *Esterhuysen* 28075 (BOL). **3321 (Ladismith)**: Swartberg near Ladismith, Toverkop (AD), *Esterhuysen* 28241 (BOL).

TANZANIA: Mt Meru, Arumeru District, *Gereau* 1623 (PRE); Kilimandjaro-Süd, Korongo, *c.* 3000 m, *Schlieben* 4869 (B, K, PRE, SRGH); Kilimanjaro, tra la Peters Hut a la Bismarks Hut, *c.* 2900 m, *Pichi Sermolli* 5136 (BR, K, P); Ob. Urwald über Kibosho, *c.* 2800 m, *Uhlig* 185 (B, K); Mt. Meru, W. slopes above Olkakola Estate, 3300 m, *Hedberg* 2306 (K, S); Kilimanjaro, above Marungu, *c.* 2 km from Peter's Hut, 3700 m, *Hedberg* 1288 (BR, K, S); Mbeya, Kilando, 8000 ft, Herb. I.R.L.C.S. 6700 (K); Kilimanjaro, Petershutte, 4100 m, *Peter* 1212 (B); Kilimanjaro, 2000–3000 m, *Meyre* s.n. (B); Kilimanjaro, *Volkens* 1155 (B); Usambara, *Holst* 3824 (B); Kissenye, Ninagongo, 3000 m, *Mildbraed* 1372 (B); NO Kivu, W. Kalago, *c.* 2300 m, *Mildbraed* 1651 (B); Arusha National Park, crater of Mt. Meru, below Njeku Hut, 2560 m, *Pócs & Kornas* 6521/A (BR).

UGANDA: Mt. Elgon, 9000 ft, *Dümmer* 3560 (BOL, K, NBG); Ruwenzori Mountains, Nyamagasani Valley, 12500 ft, *Loveridge* 197 (K, SRGH); Ruwenzori, Lanuri *c.* 3500 m, *Bequaert* 4544 (P); Ruwenzori, le vallée du Mobuku, Val de Kabuamba, 3500 m, *Alluaud* 274 (P); Ruwenzori, vall. du Mobuku, abri sous roche de Buamba, 3500 m, *Alluaud* 275, (K, P); Ruwenzori (Est), vallée du Mobuku, rocher de Kichuchu, 3000–3200 m, *Alluaud* 310 (P); Ruwenzori (Est), vallée du Mobuku, abri sous roche de Buamba, 3500 m, *Alluaud* 276 (P); Toro District, Ruwenzori, Bigo, 3350 m, *Osmaston* 3921 (K); Ruwenzori, Nyamudamba, *c.* 10000 ft, *Scott Elliot* 8094 (K); NE Elgon, *Tweedie* 2745 (K); Ruwenzori, Mijusi Valley, 3500 m, *Hedberg* 613 (K, S); Mt. Elgon, *c.* 11 000 ft, *Allen* 3676 (K); on Elgon at Benet, 9100 ft, *Eggeling* 2454 (K); Mt. Elgon, *Rose* 10267 (K); Western Province, Bigo, R. Bujuku Valley, 3550 m, *Osmaston* 1738 (BR); Ruwenzori, *c.* 3500 m, *Bequaert* 4544 (BR).

ZIMBABWE: Inyanga District, 6500 ft, *Chase 5100* (NU); Inyanga, 7000 ft, *Patterson 29* (GRA); Vumba Mountains, Umtali District, Eagle School road, *Jackson* 29 (GRA).

WITHOUT EXACT LOCALITY: Natalia, *Buchanan* 83 (B); loco incerto, ex Herbario Natalensi, *sine coll.* s.n. (S); loco incerto, *Buchanan* s.n. TM522c (PRE); Natal, *Medley-Wood* s.n. TM520c (PRE); loco incerto, *Dinter* 575, A-only (B); Muhonora, 3500 m, *De Witte* 1962 (BR); Karisimbi (versant sud) nr. Biuri, *c.* 3000 m, *De Witte* 1246 (BR); South Africa, ?Rivier, *Lincke* 57 (BR); Basutuland, *Koopoeitz* s.n. (GRA); loco incerto, *sine coll.* s.n. NH-9784 (NH).

Sledge (1973) cited *Polystichum fuscopaleaceum* as synonymous with *P. setiferum* var. *nigropaleaceum* (H. Christ) Sledge [= *P. nigropaleaceum* (H. Christ) Diels]. Christ (1893) described this variety from a single specimen collected by H.F. Blanford at 4000 ft in the Jumna valley between Mussoorie and Lokwah, western Himalayas. Sledge did not examine the type of this variety as he was unable to locate it. Fraser-Jenkins (Fraser-Jenkins & Khullar, 1985) reported he had studied the type in the Manchester Herbarium (MANCH). A Blanford specimen from the same locality has since been located in the Paris Herbarium (P!) and may serve as an isotype. This plant shows no clear affinity with either *P. fuscopaleaceum* or *P. setiferum,* but rather to the *P. luctuosum* group (section *Xiphopolystichum*) as was suggested by Christ. Fraser-Jenkins & Khullar (1985) consider it synonymous with *P. discretum* (D. Don) J. Sm.

DIAGNOSTIC FEATURES AND RELATIONSHIPS. *Polystichum wilsonii* and *P. transvaalense* occur sympatrically and often grow side by side. This has led to a great deal of confusion in separating the two taxa from one another. Pichi Sermolli (1977) referred to them as altitudinal vicariants, with *P. wilsonii* (as *P. fuscopaleaceum* var. *ruwensoriense*) occurring at higher elevations, having narrower blades, and a denser covering of wider, approximately rounded, acuminate paleae with those on the stipe being pale. In 1985 Pichi Sermolli added further observations as to how the two taxa differ. In var. *ruwensoriense* (= *P. wilsonii*) he found the apical part of the pinnae to be acute, moderately incised and usually provided with sori, whereas in var. *fuscopaleaceum* (= *P. transvaalense*) it is acuminate, deeply incised and devoid of sori.

Jacobsen (1978), who refers to *P. wilsonii* as the 'Drakensberg Form' of *P. setiferum* var. *fuscopaleaceum*, provides some characteristics of the species and ascribes several collections in the National Herbarium, Pretoria (PRE) to it. Many of these collections, however, belong to other species.

Polystichum wilsonii is separated from *P. transvaalense* by the slightly shorter and narrower fronds, shorter stipe, a more pronounced reduction and deflexing of the basal pinnae, and in the paleae. Larger paleae in *P. wilsonii* extend from the stipe to the rachis, are generally complanate at maturity and somewhat polished. The smaller paleae are more rigid with shorter and less divided marginal outgrowths. In *P. transvaalense* the larger paleae are mostly restricted to the stipe and proximal part of the rachis and become somewhat shrivelled at maturity. The marginal outgrowths on the proximal part of the smaller stipe paleae are also longer, more divided, and more twisted. *Polystichum wilsonii,* although often present in forests at lower elevations with *P. transvaalense,* is predominantly a high altitude species occurring in exposed conditions. A natural hybrid between the putative species was described as *P.* × *saltum* (Roux, 1997*a*).

Polystichum wilsonii forms part of the section *Lasiopolystichum* Daigobo assemblage of species. More recently (Kung & Zhang, 1998) *P. wilsonii* has been placed as a synonym of *P. sinense* H. Christ. I choose to maintain the two as distinct species pending critical study.

VARIATION. Morphological variation in *Polystichum wilsonii* is mostly restricted to the larger paleae present on the stipe and abaxially on the rachis. Variation is most apparent in the size, density and colour of the paleae. Larger paleae are broad in plants growing in more exposed habitats; they are more densely set. In plants from deeply shaded forest habitats, however, the larger paleae cannot be readily separated from the smaller paleae, especially on the rachis. Palea size and density thus appear to be environmentally influenced. No correlation could be drawn between habitat and

palea colour, consistent with Schelpe's (1967) remark that forms with dark paleae intergrade with forms with pale stipe paleae. The large paleae are generally stramineous and concolorous. In some plants, however, the larger stipe paleae are bicolorous with the proximal central part of the paleae being densely impregnated with phenolic substances and castaneous. In some plants these bicolorous paleae are restricted to the proximal part of the stipe, whereas in others they may extend to the basal pinnae. More rarely the larger paleae on the rachis are nitid, densely impregnated throughout, almost black, and extend to the lower half of the rachis.

Schelpe & Anthony (1986), in their key to the South African *Polystichum* species, used the direction and length of the pinnule aristae to distinguish between taxa. In some plants the basal basiscopic aristae of each pinnule may fold over the adaxial surface of the pinnule lamina, but in others they may not. Arista length also varies considerably. In some plants it may be relatively short but in others unusually long. In some plants the basal basiscopic aristae curve away from the pinnule lamina. Indusium size shows some variation with the margins ranging from repand to erose.

DISTRIBUTION AND ECOLOGY. *Polystichum wilsonii* has a wide distribution ranging from Africa to the Uttar Pradesh mountains in northern India, and to Bhutan, China (Szechuan) and Taiwan (Ilan, Taichung, Hsinchu). In the study area *P. wilsonii* has a disjunct distribution. In South Africa it occurs on the southern Cape mountains, along the KwaZulu-Natal Drakensberg and into Lesotho, extending along the Free State-KwaZulu-Natal escarpment as far north as the Vryheid District. To the north it occurs in the mountainous areas of Zimbabwe, Tanzania, Kenya, Uganda, Ethiopia and the Kivu Ridge in the Democratic Republic of Congo. The species is also known from Mt. Cameroon and the island of Bioko, 32 km from the mainland in the Gulf of Guinea. It has furthermore been recorded from Grande Comore *c.* 300 km from the mainland in the Mozambique channel. Although the higher ground of the Zambezian Region, which includes Zimbabwe and Malawi, supports Afromontane plant communities (White, 1983), it is rare in this region with only one collection known from Zimbabwe.

The lithology, climate and vegetation associated with *Polystichum wilsonii* vary considerably through its range. In the southern Cape *P. wilsonii* occurs at 1500–2000 m in acidic sandy soils derived from sediments of the Cape Supergroup. These soils support the unique Mesic Mountain Fynbos (Moll et al., 1984). This area is the only part of the distribution range of the species that experiences winter rainfall (April–September).

In the Drakensberg *Polystichum wilsonii* is associated with the Clarens Sandstone formation, the Drakensberg Basalt Formation and the intrusive Karoo dolerites. At lower elevations in the Drakensberg (1250–1800 m) the species commonly occurs along streambanks or on rocks in Undifferentiated Afromontane forests and scrub forests confined to sheltered ravines and mountain slopes. These forests are largely associated with the Clarens Sandstone Formation. At higher elevations (>1600–1800 m) the Drakensberg Basalt formation and the intrusive Karoo dolerites are prevalent. These formations support the *Themeda-Festuca* Alpine veld (Acocks, 1988). Here *P. wilsonii* occurs among boulders along streams, in dry exposed rock crevices or in wet and shaded rock overhangs.

The Ethiopian and Kenyan highlands, Mt. Elgon, Mt. Meru, Mt. Kilimanjaro, Mt. Cameroon, Bioko and the Comoro Islands are all of volcanic origin or consist in part of volcanic deposits. Many of the isolated mountains are still volcanically active today. Also the Kivu Ridge, which is largely composed of Precambrian rocks, has local exposures of volcanic deposits. On all these mountains the vegetation diminishes in structure from the lower slopes to the summit. Local features such as aspect, exposure incidence of frost, depth of soil and overall patterns of climate contribute to modify the vegetation (White, 1983). At these elevations the plants become smaller and the apical pinnae more pronouncedly conduplicate along the rachis.

In tropical Africa *Polystichum wilsonii* occurs in a wide range of vegetation types. At lower elevations on Mt. Elgon (2550 m) and the Ethiopian highlands (2700 m) it occurs in Undifferentiated Afromontane forests. On the Ethiopian highlands the species also occurs in single-dominant Afromontane forests such as *Juniperus procera* forests on Mt. Wuchada (2600 m) and *Hagenia abyssinica* forests in the Bale Mountains. On Mt. Kenya it has been recorded from the Afromontane bamboo zone. On Mt. Kenya (3200 m), Mt. Meru (3300 m), Mt. Elgon (3500 m) and the Bale Mountains (3500 m) it occurs in Afromontane bushland and thicket. Again on the Bale Mountains (3500 m) and on the rim of the caldeira round Lake Wanchi (3650 m) it occurs in Afromontane and Afroalpine shrubland. With an increase in elevation the latter vegetation type is replaced by Afromontane and Afroalpine grassland. *Polystichum wilsonii* has been recorded from this vegetation type on Mt. Kilimanjaro (3000 m) and the Ethiopian highlands (3900 m). On Mt. Cameroon *P. wilsonii* has been recorded from 1950 m to 3800 m and on the island of Grande Comore from 1000 m to 1400 m. In both cases the plants were associated with lava flows.

Growth in *Polystichum wilsonii* shows a degree of seasonality. In the Drakensberg several new fronds are produced almost simultaneously at the onset of the rainy season in November. This pattern is retained in cultivated plants. Several Afroalpine vegetation types are subject to periodic burning. Fires, however, appear to have little or no damaging effect on the rhizomes.

9. **Polystichum × saltum** J.P. Roux in *Bot. J. Linn. Soc.* **124**: 376, fig. 1 (1997). Type: South Africa, KwaZulu-Natal. 2828 (Bethlehem): Royal Natal National Park, Gudu Forest, near Gudu Waterfall, *c.* 1800 m (DB), *Roux* 2510b (NBG!-holotype).

Plants terrestrial or epilithic. *Rhizome* erect to suberect, to 20 mm in diameter, densely set with roots, closely set persistent stipe bases, and brown to ferrugineous paleae. *Fronds* caespitose, to 19 per plant, erect to arching, to 400 mm long: *stipe* proximally stramineous, greenish distally, shallowly sulcate adaxially, to 110 mm long, to 4 mm in diameter, densely paleated, the paleae of two types; larger paleae broadly attached, brown to ferrugineous, chartaceous, lanceolate to narrowly lanceolate, cordate, often slightly auriculate, the margins closely to widely set with short and long, straight or curved, often forked projections, the apex always terminating in a long acicular cell, to 11 × 3.5 mm; smaller paleae brown to ferrugineous, chartaceous, short- or long-stalked, narrowly triangular, cordate to cordate-imbricate, the proximal margins closely set with short and long, straight or angular, simple or branched projections, the number and size of the projections reduced distally, the apex usually simple, terminating in a long acicular cell, to 6 × 1 mm: *lamina* 2-pinnate, narrowly ovate, to 300 mm long, with up to 17 free pinna pairs: *rachis* greenish throughout, adaxially shallowly sulcate, densely paleated, the proximal paleae of two types; larger paleae similar to those on the stipe and reduced in size towards the middle of the lamina; smaller paleae short- or long-stalked, ferrugineous, chartaceous, narrowly lanceolate to narrowly triangular, slightly cordate to cordate-imbricate, often slightly auriculate, the margins proximally with short and long, straight or curved, often branched projections that are reduced in size and frequency distally, the apex usually simple, terminating in a long acicular cell, to 6 × 1 mm: *pinnae* 1-pinnate, long-stalked, proximally widely spaced, slightly

reduced, deflexed, with up to 10 free pinnule pairs, slightly overlapping distally, narrowly ovate to oblong-attenuate, to 75 × 24 mm: *pinna-rachis* greenish, adaxially shallowly sulcate, sparsely paleated; paleae ferrugineous, chartaceous, long-stalked, narrowly triangular to narrowly oblong, cordate to cordate-imbricate, the margins proximally with long, straight or twisted, simple or forked projections reduced in size and frequency distally, the apex usually simple, terminating in a long acicular cell, to 3.5 × 0.5 mm: *pinnules* opposite to alternate, firmly herbaceous, pale- to olive-green adaxially, slightly paler abaxially, the proximal acroscopic pinnule usually slightly longer than the next, asymmetric, ovate to ovate-rhomboid, basiscopically narrowly cuneate, acroscopically broadly cuneate and auriculate, the auricle often incised midway to costa, serrate to doubly serrate, long-aristate, to 18 mm long; adaxially sparsely set with a few twisted paleae chiefly along proximal part of costa, stramineous, chartaceous, filiform or with a few short marginal projections near the base, the apex always terminating in a long acicular cell, to 2 mm long; abaxially sparsely paleated, stramineous, chartaceous, long-stalked, narrowly deltate to filiform, the margins proximally with long, curved or angular, simple or branched projections, the apex simple, always terminating in a long acicular cell, to 3 mm long. *Venation* raised abaxially. *Sori* circular, *c.* 1.2 mm in diameter, terminal or near terminal on abbreviated vein branches, essentially uniseriate, discrete: *sporangium* with 13–(14)–17 indurated annulus cells; stalk eglandular: *indusium* brown, chartaceous, persistent, peltate, circular, frequently with long central processes, fimbriate, the maximum radius 0.8–(0.9)–1.02 mm. *Spores* aborted, the perispore closely perforated. *Chromosome number* 2n=164, meiosis yielding univalents and bivalents (Roux, 1997*a*).

DIAGNOSTIC FEATURES. *Polystichum* × *saltum* closely resembles *P. wilsonii* in size, frond and pinnule morphology, and to a certain degree in the characteristics of the paleae. The erose to fimbriate indusium, however, is more characteristic of *P. transvaalense*. The mean guard cell length, the adaxial epidermal cell length, and the mean maximum radius of the indusium are anomalous – being larger than that of either progenitor (Roux, 1997*a*). Perhaps the most distinctive diagnostic feature of the taxon is the varying number of aborted spores borne in the sporangia.

DISTRIBUTION AND ECOLOGY. *Polystichum* × *saltum* is currently known from only one forest in the foothills of the KwaZulu-Natal Drakensberg. This forest fragment forms part of the Highland Sourveld vegetation type (Acocks, 1988) and is nestled in a sheltered ravine on a steep mountain slope. Forests of this type, situated at 1500 to 1700 m, are mostly cool and moist throughout the year, even though most of the rainfall occurs during the summer (November-March). Like its putative parents, *P.* × *saltum* also occurs on moist moss-covered boulders along streams or on the forest floor in permanently moist conditions. *Polystichum wilsonii*, a taxon mostly associated with higher elevations where it occurs in more exposed habitats, frequently grows sympatrically with *P. transvaalense* in forests along the Drakensberg.

10. **Polystichum marionense** Alston & Schelpe in *J. S. African Bot.* **23**: 106, fig. 1a, t. 34 (1957). Type: Marion Island, *Moseley* s.n. (BM!-holotype).
Fig. 10.

Plants terrestrial or epilithic. *Rhizome* short, decumbent, branched, stoloniferous, to 5 mm in diameter, set with roots, closely spaced persistent stipe bases, and paleae; paleae sessile, ferrugineous to castaneous, scarious. *Fronds* crowded, to 8 per plant, erect, to 940 mm long: *stipe* proximally castaneous, distally stramineous, adaxially shallowly sulcate, to 290 mm long × 4 mm in diameter, proximally close-set with unicellular pyriform glands, also sparsely to densely paleated; paleae sessile, ferrugineous to castaneous, scarious, lanceolate to broadly ovate, cordate to cordate-imbricate, the margins with irregularly spaced, unicellular pyriform glands (which also occur superficially) and short or long flagelliform outgrowths terminating in either a long filiform cell, a long filiform thin-walled cell, or rarely in a pyriform glandular cell, the apex terminating in an acicular or small thin-walled cell, to 11 × 3 mm: *lamina* 1-pinnate-pinnatifid to 2-pinnate, with up to 16 free pinna pairs, narrowly ovate to oblong-acute, to 285 mm long, the pinnae proximally wide-spaced, imbricate towards the apex, the most proximal pinna pair slightly to strongly reduced: *rachis* stramineous, shallowly sulcate adaxially, moderately set with unicellular pyriform glands and sparsely to densely paleated; paleae sessile, ferrugineous to stramineous, scarious, lanceolate to narrowly ovate, cordate to cordate-imbricate, the margins irregularly set with unicellular pyriform glands (which also occur superficially), short cuneate-emarginate outgrowths often terminating in a unicellular glandular cell, and short or long flagelliform outgrowths (which also occur superficially) terminating in either a long filiform cell, a long filiform thin-walled cell, or rarely in a pyriform glandular cell, the apex teminating in an acicular or thin-walled cell, to 7 × 2 mm: *pinnae* pinnatifid to 1-pinnate, with up to 5 free pinnule pairs, short-stalked, triangular, ovate, deltoid or oblong, to 36 × 18 mm: *pinnules* opposite to alternate, proximally short-stalked and widely spaced, sessile and imbricate towards the apex, firmly herbaceous to coriaceous, dark green adaxially, slightly paler abaxially, broadly ovate to circular, broadly cuneate, the margins shallowly crenate to dentate, revolute in plants from exposed habitats, to 11 mm long; adaxially sparsely set with a few twisted, cartilaginous, castaneous paleae chiefly along the pinna-rachis or costa; paleae short-stalked, linear to oblong, the margins subentire, with a few short cuneate-emarginate outgrowths or rarely with a few unicellular pyriform glandular cells and/or flagelliform outgrowths, the apex terminating in an acicular cell, to 3 mm long; abaxially sparsely to moderately set with hairs and scarious, stramineous to ferrugineous paleae, the paleae sessile, narrowly lanceolate to narrowly ovate, cordate, the margins (and often superficially) with unicellular, pyriform glandular cells, short cuneate outgrowths that often terminate in a unicellular glandular cell, and often with a few flagelliform outgrowths terminating in an acicular or thin-walled cell, to 5 mm long. *Venation* raised. *Sori* circular, to 1.5 mm in diameter, medial to inframedial, uniseriate, discrete but slightly confluent in depauperate plants; exindusiate: *sporangium* with 11–(14)–20 indurated annulus cells. *Spores* castaneous, the perispore folded to form closely set low tubercles, verruculate to echinulate, the exospore 30–(37.78)–78 × 24–(28.62)–36 µm. *Chromosome number* unknown.

MATERIAL EXAMINED

MARION ISLAND (46°54′S, 37°45′E): Black Hagless River near Kildalkey Bay, *Gremmen* s.n. (WAG); Macaroni Bay en route to Stony Ridge, *Rand* 3270 (BOL, PRE); grey lava cliffs near Duikers Point, 10 m, *Huntley* 466 (NBG-2 sheets, PRE-2 sheets); Marion Island, *Mostert* 15 (NBG, PRE); valley in cliffs above Prinsloo Lake, 25 m, *Huntley* 788 (NBG-2 sheets); Nellie humps, ± 40 m, *Huntley* 137 (BOL, NBG); stream adjacent Kildalkey hut, ± 100 m, *O'Connor* 1003 (BOL, NBG); cliffs at Goodhope Bay, *Rand* 3653 (BOL); between station and Skua Ridge, *Rand* 3766 (BOL); *Rand* 3192 (BM, BOL), 3271 (BM, BOL), 3690 (BM, BOL).

PRINCE EDWARD ISLAND (46°38′S, 37°57′E): cliffs S. of cave on E. coast, ± 25 m, *Huntley* 657 (BOL, NBG).

DIAGNOSTIC FEATURES AND RELATIONSHIPS. *Polystichum marionense* differs from any other taxon in the study area in having

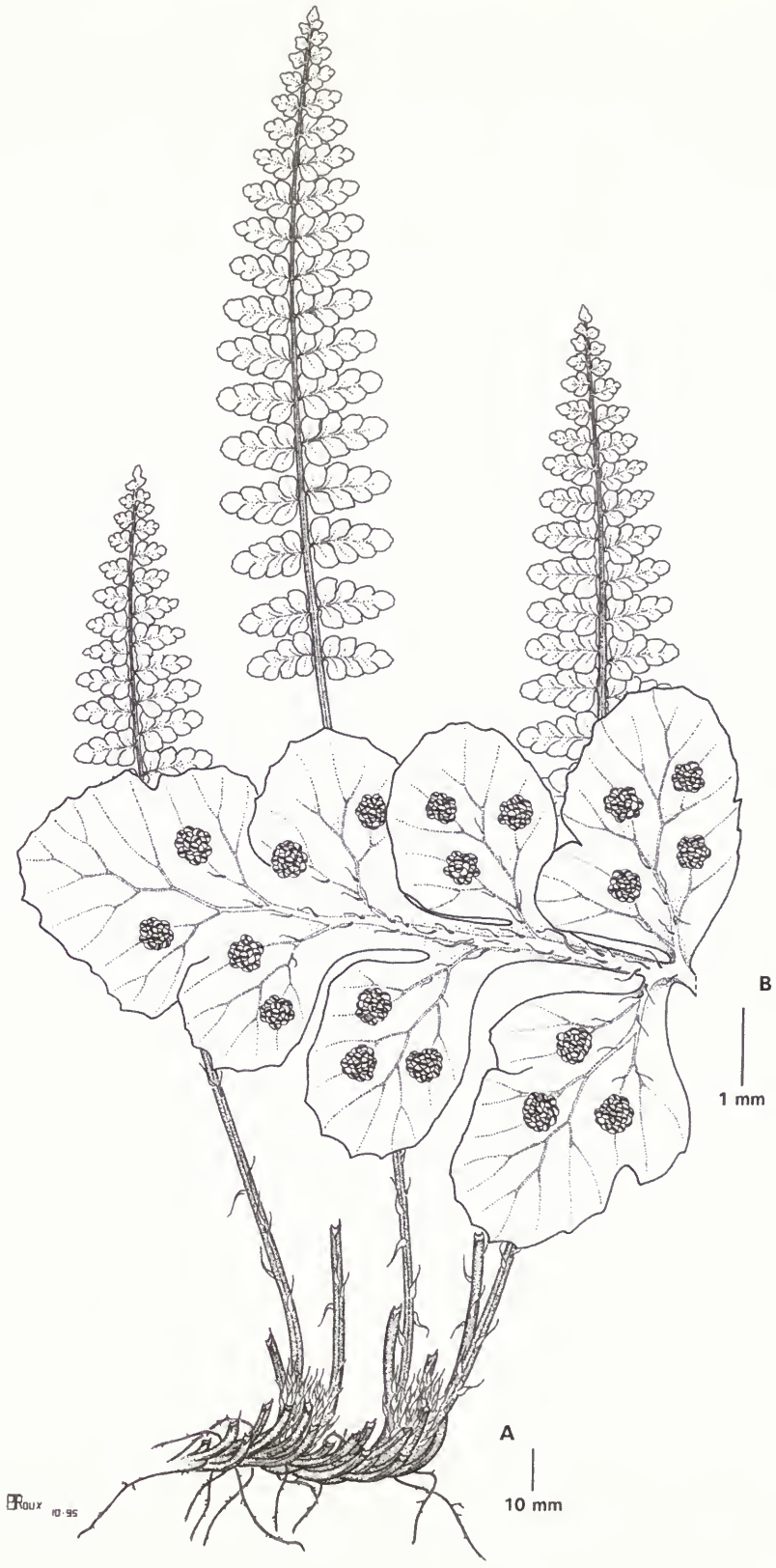

Fig. 10 *Polystichum marionense*. A, habit; B, abaxial surface of fertile pinna. All drawn from *Huntley* 466 (NBG).

a thin, decumbent and branched rhizome, pinnae that are not acroscopically developed, raised veins with few dichotomies, exindusiate sori situated along the veins and not at the vein endings, and paleae with unicellular glandular cells and flagelliform outgrowths along the margins and frequently also superficially.

Alston & Schelpe (1957) considered the species to belong to the *Polystichum mohrioides* (Bory) C. Presl group. In this group they included *P. plicatum* (Poepp.) Hicken from the Andes and South Georgia, *P. elegans* J. Rémy from the Andes, *P. scopulinum* (R.J. Eaton) Maxon and *P. lemmonii* Underw. from the western United States, and *P. cystostegia* (Hook.) J.B. Armstr. from New Zealand. *Polystichum plicatum* and *P. elegans* are sometimes considered to be varieties of *P. mohrioides*, but I found *P. mohrioides* to be extremely variable and could not on the grounds of the palea, indusium, sporangium and spore morphology distinguish between these taxa. I furthermore do not consider them related to *P. marionense,* as in this species the paleae bear long flagelliform outgrowths along the margins which often terminate in a glandular cell and are exindusiate. In *P. mohrioides* the paleae margins are subentire, but mostly bear a few short angular outgrowths. The palea apex always terminates in a short acicular cell. The indusia are large and mostly bear a variable number of pyriform cells along the margin and often also on the adaxial and abaxial surfaces. *Polystichum cystostegia* and *P. mohrioides* are clearly related as both are characterized by similar paleae and indusia. *Polystichum scopulinum* and *P. lemmonii* are related as can be judged from the paleae with short angular marginal outgrowths and apices that terminate in either an acicular cell or a small thin-walled cell. This is supported by the findings of Wagner (1979). *Polystichum scopulinum* and *P. lemmonii* are not considered to be related to either *P. marionense* or *P. mohrioides*. The affinity of *P. marionense* remains obscure.

VARIATION. Variation in *Polystichum marionense* on Marion and Prince Edward Islands can be ascribed to environmental influences. Plants from well protected sites are large, the pinnae widely spaced, and the stipe sparsely paleated. Plants from more exposed sites are generally depauperate, densely paleated, and the pinnae coriaceous and closely imbricate with the pinnule margins strongly revolute. Pinnae of depauperate forms are often arranged perpendicular to the lamina axes. Minor variations also occur in the paleae. In some collections the flagelliform marginal outgrowths are extremely long whereas in others they are short. Also the occurrence of such outgrowths from the surface of the palea varies from collection to collection. The limitation of unicellular glands to the proximal part of the palea surface seems to be fairly constant. Unicellular pyriform glandular cells on the adaxial and abaxial surfaces of the lamina have only been observed in *Huntley* 788 (NBG).

DISTRIBUTION AND ECOLOGY. *Polystichum marionense* is known only from Marion Island, Prince Edward Island and Possetion Island of the Crozet group in the Southern Ocean (Alston & Schelpe, 1957; Gremmen, 1982). Since the floras of the subantarctic islands are poorly known the species may have a wider distribution than is currently known. On Marion and Prince Edward Islands the species is only known from low-lying areas, with most collections having been made at elevations between 10 and 100 m above sea-level. The plants form large clumps in basalt rock crevices and at boulder and cliff bases. Huntley (1971) reported the plant to always occur in sites protected from the predominantly westerly and north-westerly winds.

11. **Polystichum transkeiense** W. Jacobsen in *J. S. African Bot.* **44**: 169 (1978). Type: South Africa, Transkei, Port St Johns, near road to Second Beach, deep shade in forest, 67 m, *W.B.G. Jacobsen* 4301 (PRE!-holotype).

Fig. 11.

Plants terrestrial or epilithic. *Rhizome* prostrate, widely creeping, branched, to 10 mm in diameter, set with roots, closely to widely spaced persistent stipe bases, and paleae (which are restricted to apical region); paleae broadly attached, stramineous to castaneous, chartaceous, narrowly lanceolate, cordate to cordate-imbricate, the margins repand to erose, generally without thin-walled hair-like cells, the apex often flagelliform, mostly terminating in a thin-walled cell, to 8.5 × 1.5 mm. *Fronds* usually widely spaced, 4–6 per plant, arching, to 1.34 m long: *stipe* firm, adaxially sulcate, proximally castaneous, stramineous distally, to 710 mm long × 4 mm in diameter, proximally densely paleated; paleae broadly attached, castaneous to stramineous, chartaceous, narrowly to broadly ovate, cordate to cordate-imbricate, the margins repand, erose to fimbriate, with or without thin-walled cells, the apex often flagelliform, terminating in a thin-walled cell, to 7 × 2.5 mm; distally sparsely paleated, becoming glabrous with age: *lamina* 2- or 3-pinnate, with up to 22 pairs of free pinnae, firmly herbaceous, adaxially dark green, somewhat paler abaxially, ovate to broadly ovate, to 655 mm long, the proximal pinna pair reduced in size: *rachis* stramineous to greenish, adaxially sulcate, sparsely paleated; paleae short-stalked, stramineous, chartaceous to membranous, narrowly oblong to narrowly ovate, cordate to hastate, the margins proximally repand, erose, or set with short and/or long irregular outgrowths, often with filiform outgrowths terminating in a thin-walled cell, distally repand to entire, flagelliform, terminating in a filiform cell or a thin-walled cell, to 6 × 1 mm: *pinnae* 1-pinnate or 2-pinnate, with up to 20 pairs of free pinnules, proximally widely spaced, mostly not overlapping, distally frequently overlapping; proximal pinnae narrowly ovate to narrowly oblong-attenuate, those towards the middle of the lamina ovate, narrowly oblong to oblong-attenuate, to 240 × 75 mm: *pinna-rachis* stramineous, adaxially sulcate, sparsely to densely paleated; paleae short-stalked, stramineous, chartaceous to membranous, linear, narrowly triangular to narrowly ovate, cordate to hastate, the margins proximally with short and/or long irregular outgrowths often terminating in a thin-walled cell, distally entire, twisted, the apex terminating in a filiform or thin-walled cell: *pinnules* short-stalked, opposite to alternate, widely spaced to overlapping, the proximal acroscopic pinnule the largest, the proximal basiscopic pinnule on basal pinna pair generally significantly smaller than the next basiscopic pinnule, inaequilateral, ovate, ovate-oblong to ovate-rhomboid, acuminate to obtuse, acroscopically auricled, shallowly to deeply incised, lobate-serrate, the lobes oblong, the proximal acroscopic auricle obovate, sharp-tipped to aristate, the costa adaxially proximally sulcate, sparsely paleated; paleae stramineous, membranous, twisted, simple or proximally with short or long angular outgrowths, the apex terminating in a filiform or a thin-walled cell, to 2.6 mm long, abaxially sparsely to moderately paleated; paleae stramineous, membranous, narrowly triangular to narrowly ovate, short-stalked, cordate to cordate-imbricate, the margins proximally erose or with short and/or long angular outgrowths or with long filiform outgrowths terminating in a thin-walled cell, distally entire, flagelliform, twisted, the apex terminating in a filiform or thin-walled cell, to 1.5 mm long. *Venation* raised. *Sori* circular, *c.* 1 mm in diameter, near or at the apex of abbreviated veins, discrete at maturity: *sporangium* with 10–(13)–19 indurated annulus cells; stalk eglandular: *indusium* absent. *Spores* 64 per sporangium, brown, the perispore folded to form a reticulum of inflated ridges, the ridges with a high crest, variously but mostly sparsely echinulate, minutely perforated, the exospore 32–(38.8)–46 × 22–(28.4)–36 µm. *Chromosome number* 2n=164.

MATERIAL EXAMINED

SOUTH AFRICA. 2330 (Tzaneen): Woodbush (CC), *Jenkins* 919 (PRE).

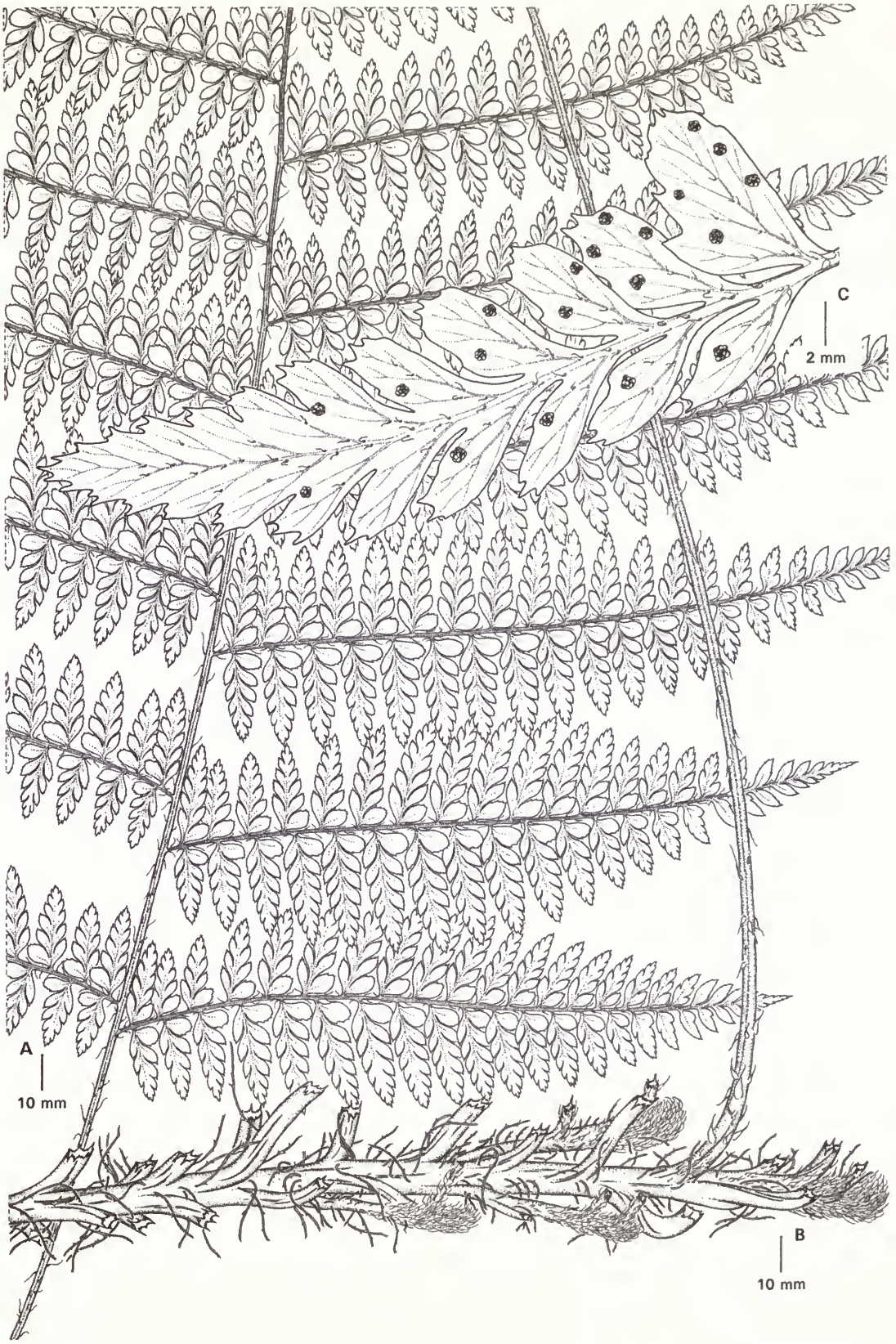

Fig. 11 *Polystichum transkeiense*. A, proximal part of lamina; B, rhizome; C, abaxial surface of fertile pinnule. A & C, drawn from *Roux* 2541 (NBG); B, drawn from *Roux* 2539 (NBG).

2430 (Pilgrim's Rest): Mariepskop (DB), *Burrows* 3150 (PRE). **2531 (Komatipoort)**: Barberton, Ida Doyer Nature Reserve, 1100 m (CC), *Muller* 2107 (PRE); Barberton, Maid of the Mist, *Thorncroft* 40 (PRE). **2730 (Vryheid)**: Pongola Bush Reserve, Stinkwood Falls, 1550 m (BC), *Glen* 2436 (PRE). **2731 (Louwsburg)**: Ngome Forest Reserve (CD), *Roux* 2535, 2536, 2537, 2538, 2539, 2540, 2541 (NBG); Ngome Forest, *Reid* 68 (PRE); Ngome Forest, 4100 ft, *Schelpe* 6223 (BOL); Ngome Forest, *Strey* 8378, 9381 (BOL, NH), 10487 (NH); Ngome Forest, *c.* 1000 ft, *Schelpe* 6244 (BOL); Ngome Forest, along waterfall path, 1000 m, *Glen* 93, 97 (PRE). **2830 (Dundee)**: Eshowe, Hospital Wood (CD), *Lawn* 63 (NH); Qudeni Forest, 5000 ft (DB), *Fisher* 802 (NH, NU, PRE), 877 (NU), Qudeni Forest, *Jordaan* 698 (NH, PRE); Qudeni Forest, 5500 ft, *Schelpe* 6267, 6268 (BOL); Qudeni Forest, 5000 ft, *Clarkson* 87 (NU), 130 (BOL, NU); Qudeni Forest, *c.* 5000 ft, *Allsopp* 743 (NU); Qudeni, 5000 ft, *Fisher* 831 (NH, NU); Qudeni, Ekombe Forest, 5000 ft, *Fisher* 817 (NU); Qudeni Forest, 1100 m, *MacDevette* 702 (PRE); Qudeni Forest Reserve, *Van Wyk* 7306 (NH); Qudeni Forest, 5000 ft, *Fisher & Schweickerdt* 109 (NH). **2831 (Nkandla)**: Nkandla Forest (CA), *Roux* 1932 (NBG); Eshowe to Nkandla, 1080 m, *Goetghebeur* 4443 (BR, PRE); Nkandla Forest, *Schelpe* 1701 (BOL); Nkandla, 3000 ft, *Meebold* 12614 (M); Nkandla, *Schelpe* 1701 (NU); Nkandla, *Nixon* s.n. (NU); Nkandla, *Lawn* 2001 (NH). **2930 (Pietermaritzburg)**: Karkloof, farm Shawswood (AC), *Roux* 1915 (NBG); Karkloof, *Van Jaarsveld* 5026 (BOL, NBG); Karkloof, farm Ehlateni, *Roux* 1006, 1007, 1008, 1009, 1010, (NBG), 1011 (NBG, PRE); Karkloof, 'Braco', 4300 ft, *Schelpe* 5115 (BOL); Balgowan, 'Boschfontein', 4000 ft, *Schelpe* 606, 610 (NU); Balgowan, 4000 ft, *Lindahl* 102 (NU); Balgowan, 'Boschfontein', 4000 ft, *Fisher* 630 (NH, NU); Karkloof, 'Elderslie', *Rycroft* s.n. (NU); Balgowan, *Graham* 107 (NU); Karkloof Forest, Ehlatine, *Rycroft* 89 (NU); Karkloof Forest, *Wirminghaus* 610 (NU); Karkloof Forest, bank of Mshwati River, *Wirminghaus* 902 (NU); Karkloof, Colsbourne farm, *Vos & McGregor* s.n. (NU); Balgowan, *Thomas* 67 (NU); Ahrens, 'Mowbray', *c.* 5000 ft (BB), *Fisher* 993 (NU); Dargle, Kilgoblin (CA), *Smook* 579 (NU), 566 (BOL, NU); Dargle, *Esterhuysen* 26200 (BOL); Lions River District, Lions Bush, *Moll* 832, 833 (NU); Dargle, Kilgoblin, *Smook* 661 (NU); Pietermaritzburg, 2500 ft, (CB), *Sanderson* s.n. (PRE); Pietermaritzburg, Winters Kloof, *Doige* s.n. (PRE); Pietermaritzburg, Worlds View, *Venter* 736 (PRE); Pietermaritzburg, Ferncliff, *Schelpe* s.n. (BOL); Zwaartkop, *Sim* s.n. (BOL); Pietermaritzburg, Ferncliff Nature Reserve, *c.* 2500 ft, *Cowan* 120 (BOL); Pietermaritzburg, Town Bush Valley, 2500 ft, *Tosh* et al. (K); Swartkop, *Hillary* 69 (NU); Pietermaritzburg, Swartkop, *Duncan-Vale* 19 (NU); Sweetwaters, *Stinger* 58 (NU); Pietermatitzburg, Swartkop, 4000 ft, *Fisher* 723 (NH, NU); Swartkop, 4500 ft, *Nixon* 36 (NU); Cascades, Town Bush, 2900 ft, *Sidly* 49 (NU); Pietermaritzburg, Claridge, *Carnegie* s.n. (NU); Hilton Road, *Devlin* 43 (NU); Town Hill, *Carnegie* 706 (NU); Sweetwaters, *Uhjati* 52 (NU); Pietermaritzburg, Town Bush Valley, *Fisher* 693 (NU); upper Town Bush Valley, 3300 ft, *Wand* 28 (NU); Town Bush Valley, *Tosh Robinson & De Villiers* 7 (NU); Town Bush Valley, *c.* 2250 m, *Doni* 72 (NU); Pietermaritzburg, Ferncliff Nature Reserve, 1000 m, *Crouch* 556, 570, 598 (NU); Swartkop, *Clarkson* 19 (NU); Town Bush Valley, *Devlin* 34 (NU); Town Bush Valley, 3000 ft, *Fisher* 667 (NU); Ferncliff Nature Reserve, 2500 ft, *Cowan* 155 (NU); Town Bush Valley, 3000 ft, *Nieuwoudt* 56 (NU); Winters Kloof, *Doidge* P54 (PRE); Cottingham, farm Keerom, 4500 ft (CC), *Strey* 8429 (BOL, NH); Richmond, Enon Forest (CD), *Van Jaarsveld* 5044 (PRE); Inanda (DB), *Wood* s.n. (B, PRE); Camperdown, Nagle Dam, 3000 ft (DD), *Wells* 1551 (NU). **2931 (Stanger)**: 10 km from Kwasizabantu towards Mapumulo (AA), *Van Jaarsveld & Lang* 5096, 5098 (BOL, NBG), *Van Jaarsveld & Jacobs* 5851 (NBG); Alexandra District, Moyeni, 750 m (BA), *Rudatis* 1100 (B, K, NBG, P); Richmond, Enon Forest (CD), *Van Jaarsveld* 5044 (BOL, NBG). **3029 (Kokstad)**: 22 miles E. of Kokstad, 4850 ft (CB), *Schelpe* 4417, 4418 (BOL); Tabankulu Forest Reserve (CD), *Wilkins* 40 (PRE); Ingeli Bush (DA), *Taylor* 5227 (NBG, PRE); Mpetsheni Forest, Weza, *Roux* 1960, 1961 (NBG); Weza Forest, *Roux* 2493, 2494, 2495, 2497, 2498 (NBG); Mpetsheni Forest, Weza, *c.* 1000 m, *Nicholas & Marais* 1675 (PRE); Weza Forest, *Roux* 623 (BOL); Weza Forest, Bangeni Forest, 1200 m, *MacDevette* 1534 (NH). **3030 (Port Shepstone)**: Burntwood, Paddock (CC), *Strey* 5994 (BR, K, NU); Umtamvuna Nature Reserve, Long Kloof, 360 m, *Abbott* 1818 (NH); Umtamvuna Nature Reserve, Gogosa Kloof, *Abbott* 2101 (NH); Umtamvuna Nature Reserve, Verassend Kloof, 360 m, *Abbott* 1821 (NH). **3128 (Umtata)**: Tsolo, Nqadu Ridge, *c.* 1100 m, (BC) *Keeler & Cloete* 449 (NH). **3129 (Port St Johns)**: Port St Johns, Egossa Forest (BC), *Strey* 8869 (BOL, NH, NU, PRE); Lusikisiki, Magwa Falls, *Strey* 6718 (NH, PRE); Egossa Forest above Magwa Falls, 1300 m, *Venter & Vorster* 72 (BR, PRE); Port St Johns, stream at S. end of airstrip (DA), *Roux* 582 (BOL, NBG); Port St Johns, *Hardcastle* s.n. (NBG); woods at Port St Johns, *Flanagan* 2973 (PRE); Port St Johns, *Hardcastle* 281/283 (PRE); Port St Johns, *McLoughlin* 788 (BOL, PRE); Port St Johns, edge of plateau, 1200 ft, *Hardcastle* 285 (PRE); Port St Johns, *McLoughlin* S36 (PRE); Port St Johns, Agate Terrace, *McLoughlin* 780 (BOL); Port St Johns, *Isaac* s.n. (BOL); Port St Johns, Moffets Glen, *Roux* 589 (BOL); Port St Johns, *Schelpe* 357, 358 (NU); Port St Johns, *Flanagan* 2473 (PRE).

SWAZILAND. 2531 (Komatipoort): Piggs Peak, Kings Forest (CD), *Compton* 27831 (NBG, PRE); Havelock, Kings Forest, 5000 ft, *Schelpe* 6163, 6169 (BOL).

WITHOUT EXACT LOCALITY: Port Natal, *Krauss* 258 (BM); loco incerto, *Hill* 36 (PRE); loco incerto BOL 57713 (BOL); Natal, *Buchanan* s.n. (BOL); Natalia, in sylvis montis humidis, *sine coll.* s.n. (P); Pondoland, *Buchanan* 30 (P); Hlokozi, Alexandra City, 2700 ft, *Rudatis* 2309 (NBG); in sylvis montanis umbrosis humidis, *Guienzius* 28 (B); Natalia, in sylvis humidis, *sine coll.* B-97066 (B); Natal, *McKen* s.n. (B); Natal, *Buchanan* 75 (B); Pondoland, *Buchanan* 30 (B); zwischen dem grossen Wasserfall und Omsamcaba, *Drége* s.n. (B); loco incerto, *Drége* s.n. B-97092 (B); Natal, *Guienzius* s.n. B-97064 (B); loco incerto, *sine coll.* s.n. NH-26388 (NH); Prom. b. spei, *Guienzius* s.n. (BR); Natal, *sine coll.* s.n. (BR); Zululand, *Haygarth* s.n. (NH); loco incerto, *sine coll.* s.n. NH-26465 & 26466 (NH); Inanda, Great Noodsberg, Town Hill, P.M.B., *sine coll.* s.n. NH-26791 (NH); loco incerto, *sine coll.* s.n. NH-26387 A-only (NH).

DIAGNOSTIC FEATURES AND RELATIONSHIPS. The thin, widely creeping rhizome, the thin-walled cells on the paleae, and the exindusiate sori are the most diagnostic features of the species. The affinity of *Polystichum transkeiense* is yet to be determined.

VARIATION. *Polystichum transkeiense* shows extreme variation in frond morphology, even within a population. Lamina dissection varies between 2-pinnate and 3-pinnate with the pinnules showing various degrees of dissection. Pinnule lobes may vary between broadly elliptic to obovate and narrowly obovate to narrowly oblong. Palea variation is not as significant as that of the lamina. Paleae do, however, vary in outline, the degree to which the margins are sculptured, the absence or presence of thin-walled cells along the margins, and in the apex terminating in a thin-walled cell or a filiform cell. Both conditions are usually present in the same plant.

DISTRIBUTION AND ECOLOGY. *Polystichum transkeiense* is confined to the eastern parts of South Africa and northern Swaziland. This region receives its rain largely during the summer months (September–March). It is an exclusively forest-dwelling species, often growing in very wet conditions. In the southern limits of its distribution at Port St Johns, *P. transkeiense* grows in Typical Coast Belt Forest that occurs from near sea-level to approximately the 450 m contour. This region receives 900–1500 mm of rain per annum. To the north and somewhat inland it occurs in forests of the Pondoland Coastal Plateau Sourveld where it occupies a plateau to 450 m above the sea. The forests are mainly found in protected places along the escarpment such as gorges and valleys below cliffs. Rainfall in this region is high; 1150–1300 mm of precipitation is measured per annum. In the KwaZulu-Natal midlands *P. transkeiense* occurs in forests of the 'Ngongoni Veld, extending between 450 and 900 m above the sea and receives on average 750–1300 mm of rainfall per annum. Nkandla, Qudeni and Weza are among the most notable forests occurring in this vegetation type. In northern KwaZulu-Natal Afromontane forests with slightly more tropical affinity occur on the inland mountains. The extensive Ngome Forest, where *P. transkeiense* is common, is an example of this forest type. Forests of this type occur northwards to the mountains south and west of Barberton.

Rainfall in this region is high, ranging between 900–1950 mm per annum (Acocks, 1988).

Jacobsen (1978) considered 'its tendency to grow isolated in deep shade and not in large clusters. . .' as a diagnostic feature of *Polystichum transkeiense*. My observations, however, do not conform with this statement. *Polystichum transkeiense* does grow as isolated plants, but generally forms continuous, dominant stands, especially in the Weza, Karkloof, Nkandla and Ngoye forests.

12.**Polystichum magnificum** F. Ballard in *Kew Bull.* **12**: 48, f. 1 (1957). Type: Uganda, Mount Elgon, in the crater (alpine region) in a small sheltered cleft on the ridge north of Maji ya moto, 3750 m, *Hedberg* 965 (K!-holotype; K!-isotype).
Fig. 12.

Plants terrestrial. *Rhizome* short-decumbent, branched, to 12 mm in diameter, set with roots, closely spaced persistent stipe bases, and paleae; paleae broadly attached, ferrugineous, chartaceous, linear, cordate, the margins subentire or with small, widely spaced, straight or curved outgrowths, the apex terminating in an acicular cell, to 30 × 2 mm long. *Fronds* 8–12 per plant, erect to suberect, to 1.13 m long: *stipe* proximally castaneous, stramineous distally, adaxially sulcate, to 470 mm long × 9 mm in diameter, densely paleated; paleae broadly attached, ferrugineous, chartaceous, those on the proximal part of stipe narrowly ovate, cordate, the margin with small widely spaced projections, the apex terminating in an acicular cell, to 40 × 2 mm, those on the distal part of stipe more variable in size; the larger broadly attached, narrowly ovate, ovate to narrowly oblong, cordate, with the margins variously set with short and/or long, simple or forked recurved outgrowths, the apex terminating in an acicular cell, to 28 × 8 mm; the smaller short-stalked, narrowly triangular, cordate, often somewhat auricled, the margins proximally with short and/or long angular or curved outgrowths, distally entire or with small projections, the apex terminating in an acicular cell: *lamina* 2-pinnate to 2-pinnate-pinnatifid, coriaceous, adaxially dark green, abaxially slightly paler, narrowly ovate to narrowly oblong, to 660 mm long, reduced towards the base, often with a single proliferous bud near the apex, the bud paleae ferrugineous: *rachis* stramineous, adaxially sulcate, densely paleated; paleae stramineous to ferrugineous, the larger broadly attached, ovate to narrowly ovate, cordate, the margins proximally with long and/or short, straight and/or curved outgrowths, distally entire, the apex terminating in an acicular cell, the smaller short-stalked, narrowly triangular, the margins proximally with curved or angular outgrowths, distally entire, the apex terminating in an acicular cell: *pinnae* mostly somewhat overlapping, narrowly ovate to oblong, not significantly developed acroscopically, to 130 mm long: *pinna-rachis* stramineous, adaxially sulcate, densely set with paleae similar to but smaller than those on the rachis; *pinnules* proximally closely spaced, distally alternate, mostly somewhat imbricate, inaequilateral, ovate, lobate, crenate, the proximal pinnules acroscopically incised to or near to the adaxially sulcate costa, the segments unequally rhomboid to obovate, adaxially densely paleated; paleae short-stalked, ferrugineous, chartaceous, subulate, simple or proximally with short marginal outgrowths, often twisted, the apex always terminating in an acicular cell, to 5 mm long, abaxially densely paleated; paleae short-stalked, ferrugineous, subulate, straight or twisted, proximally with short marginal outgrowths, the apex terminating in an acicular cell, to 4 mm long. *Venation* raised. *Sori* circular, to 2.2 mm in diameter, uniseriate, discrete at maturity, terminal or near-terminal on abbreviated vein branches: *sporangium* with 11–(13)–17 indurated annulus cells; stalk eglandular: *indusium* peltate, circular, erose, the maximum radius 0.63–(0.94)–1.14 mm, persistent, brown. *Spores* dark brown, 64 per sporangium, the perispore relatively smooth, echinulate, closely perforated, the exospore 36–(47.78)–58 × 26–(33.37)–40 µm. *Chromosome number* unknown.

MATERIAL EXAMINED

ETHIOPIA: Bale Region, Dello Awraja, in Harrena Forest *c.* 3.3 km N. of Rira, 3040 m, *Mesfin* 5077 (ETH); Bale Mountains, E. of Kara Deema, 4140 m, *Miehe* 1497 (ETH); Bale Mountains, E. of Kara Deema, 4200 m, *Miehe* 1541 (ETH); Bale Mountains, Mendoyn Anraja, in Harrena Forest, *c.* 1–2 km S. of Riva village, 2780–2850 m, *Mesfin* 5355 (ETH); Bale Region, Dello Awraja, *c.* 3.4 km N. of Rira village, 3120 m, *Mesfin* 5332 (ETH); Arussi, Juniper forest, 9000 ft, *Thomerson* 550 (ETH, K); Darra, bamboo forest, 9000 ft, *Mulvany* 48 (K); Bale Province, Rira, 20 miles SW of Goba, 10 800 ft, *Mooney* 7192 (K); Mount Tola, Gamu Highlands, 13 000 ft, *Mulvany* 1 (K); Bale Province, *c.* 30 miles S. of Goba, Saneti Plateau, 2720 m, *Ash* 3567 (BR).

KENYA: Mount Elgon, 12 500 ft, *Tweedie* s.n. (K).

DIAGNOSTIC FEATURES AND RELATIONSHIPS. Most striking is the large stature of the plants occurring at these high elevations. Also diagnostic are the densely paleated fronds, rounded lobes, and the proliferous bud borne on the rachis near the frond apex.

The affinity of *Polystichum magnificum* is uncertain. Superficially it appears to belong to section *Lasiopolystichum* but the palea structure and the short, branched decumbent rhizome does not support such an affinity.

DISTRIBUTION AND ECOLOGY. *Polystichum magnificum* is only known from Mount Elgon, on the border between Uganda and Kenya, and the Bale, Arussi, and Gamu Gofa regions in southern Ethiopia.

On Mount Elgon *Polystichum magnificum* occurs at elevations ranging from 3700 to 3800 m. In Ethiopia it occurs from 2700 to 4200 m and grows in a wide range of afromontane vegetation communities. These include afromontane forests of the *Hagenia abyssinica* (Bruce) J.F. Gmel. and *Juniperus procera* Hochst. ex Endl. types, afromontane bamboo zone, afromontane scrubland and afromontane grassland types as defined by White (1983).

The species has been reported to form compact patches up to 1.8 m in diameter at 3000 m on Mount Tola and Mount Gughé in Ethiopia. At higher elevations *Polystichum magnificum* tends to be restricted to rock crevices where it is protected from wind and fire.

13.**Polystichum zambesiacum** Schelpe in *Bol. Soc. Brot.* sér. 2, **41**: 215 (1967). Type: Rhodesia (Zimbabwe), Umtali District, Henkels Nek, Stapleford, *Schelpe* 5751 (BOL!-holotype; BOL!-isotype).
Fig. 13.

Plants terrestrial or epilithic. *Rhizome* short-decumbent to suberect, short-branched, to 25 mm in diameter, set with roots and closely spaced persistent stipe bases, the older parts nude, the apical part densely paleated; paleae broadly attached, rugose, ferrugineous, linear, truncate to cordate, the margins variously fimbriate, often also with a few long, straight, recurved, filiform outgrowths, to 30 × 2 mm. *Fronds* caespitose, 5–8 per plant, arching, to 1.8 m long: *stipe* proximally castaneous, stramineous distally, adaxially sulcate, to 840 mm long × 9 mm in diameter, proximally densely paleated; larger paleae more widely spaced and becoming smaller distally, membranous, ferrugineous throughout or with a narrow membranous margin and a dark, nitid centre, ovate, cordate, the margins fimbriate, the apex cuspidate or flagelliform, terminating in a thin-walled cell or a filiform cell, to 16 × 10 mm; smaller paleae short-stalked, narrowly ovate to narrowly triangular, cordate to cordate-imbricate, the margins proximally with irregular angular outgrowths, often also with long, twisted, filiform outgrowths often terminating in a small thin-walled cell, sparsely fimbriate distally,

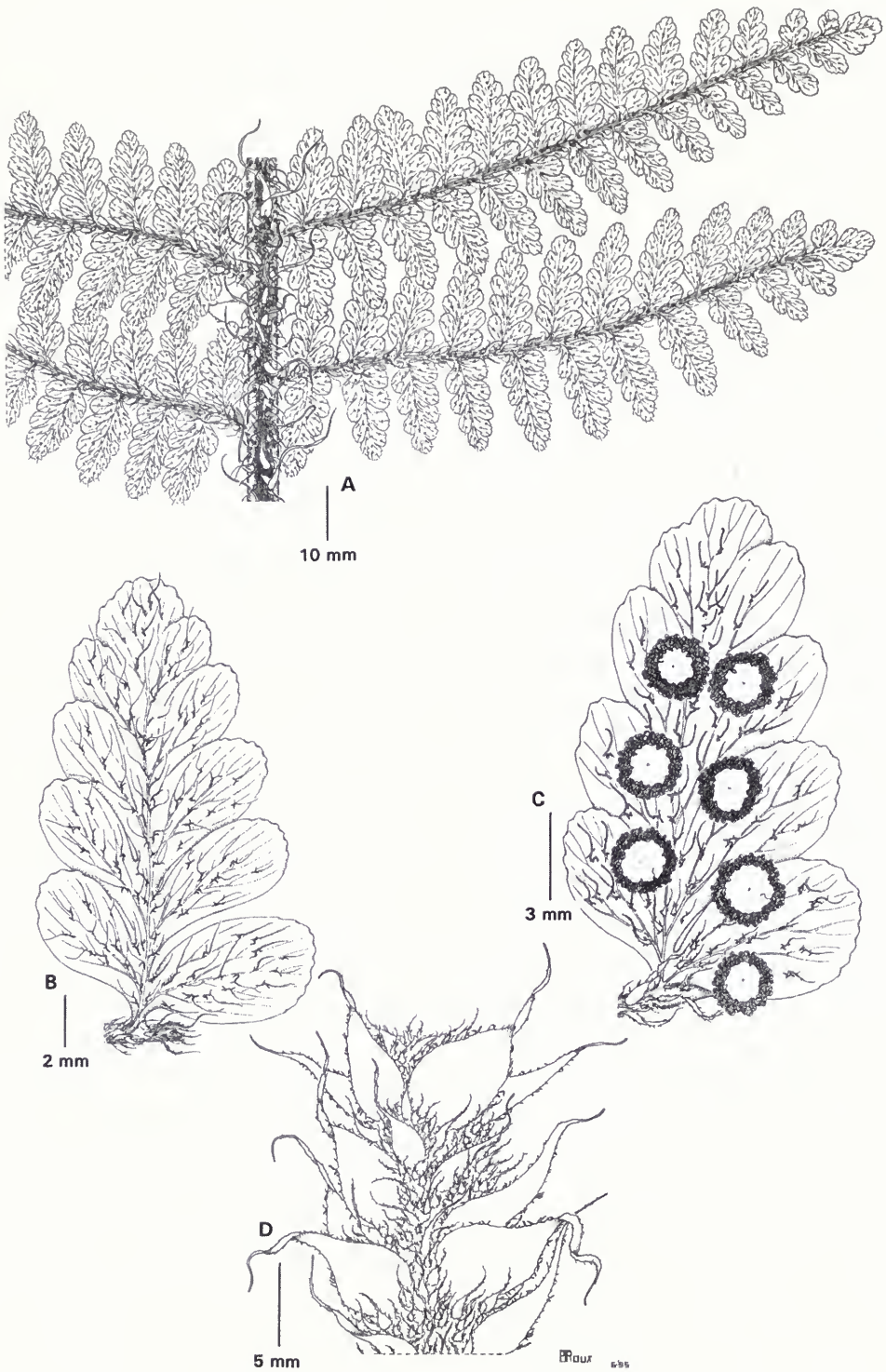

Fig. 12 *Polystichum magnificum.* A, middle pinnae of lamina; B, adaxial surface of pinnule; C, abaxial surface of fertile pinnule; D, section of abaxial surface of rachis. All drawn from *Hedberg* 965 (K).

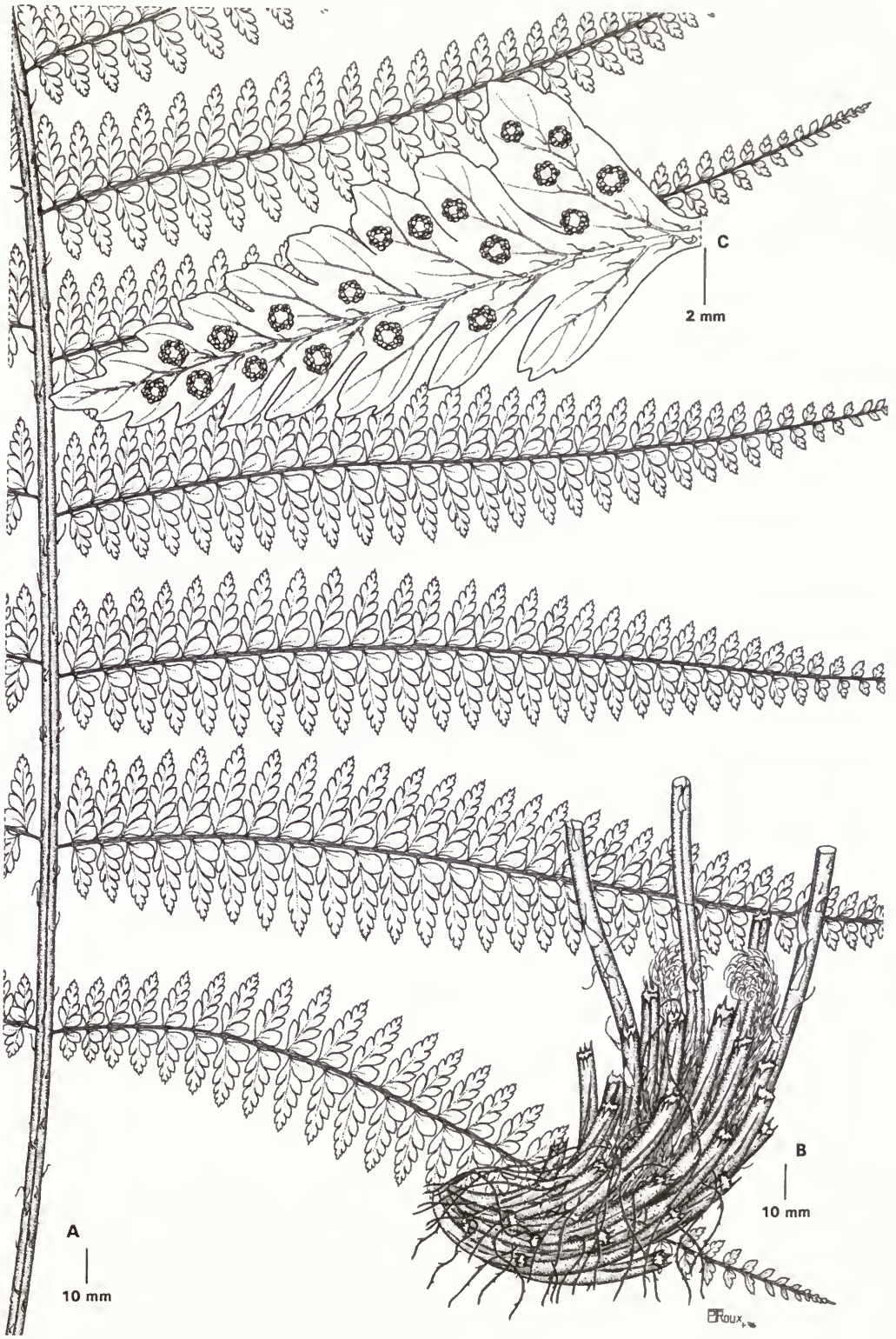

Fig. 13 *Polystichum zambesiacum*. A, proximal part of lamina; B, rhizome; C, abaxial surface of fertile pinnule. A & C, drawn from *Schelpe* 5751 (BOL); B, drawn from *Burrows* 2935 (PRE).

the apex flagelliform, terminating in a small thin-walled cell or a filiform cell; *lamina* 2-pinnate to 3-pinnate, with up to 30 free pinna pairs, firmly herbaceous, narrowly ovate to ovate, up to 890 mm long, the proximal pinna pair often slightly reduced and often somewhat deflexed: *rachis* stramineous, adaxially sulcate, often somewhat flexuous towards the apex, sparsely paleated; paleae short-stalked, chartaceous, stramineous to ferrugineous, narrowly linear, narrowly ovate to narrowly triangular, cordate to cordate-imbricate, the margins proximally with straight or angular outgrowths or with long, twisted, filiform outgrowths, distally entire or sparsely fimbriate, the apex terminating in a small thin-walled cell or a filiform cell, to 1.8 mm long: *pinnae* 1-pinnate to 2-pinnate, with up to 27 free pinnule pairs, generally widely spaced but often imbricate, lanceolate, narrowly ovate to oblong-attenuate, the proximal pinnae to 268 mm long: *pinna-rachis* stramineous, adaxially sulcate, set with paleae similar to but smaller than those on the rachis: *pinnules* opposite to alternate, widely spaced or imbricate, asymmetric, ovate-oblong, narrowly ovate to narrowly triangular, acroscopically auricled, usually somewhat reclinate, lobate-serrate, obtuse, the proximal acroscopic pinnules on basal pinnae often reduced, becoming larger towards middle of lamina, the proximal pinnules simple or incised to or near to costa, to 45 mm long; costa proximally adaxially sulcate, glabrous or with a few short-stalked, stramineous, twisted paleae; paleae filiform, simple or proximally with a few twisted outgrowths, the apex terminating in a small thin-walled cell or a filiform cell, to 1.2 mm long, adaxially sparsely paleated; paleae short-stalked, narrowly triangular to narrowly ovate, cordate, the margins proximally with short or long angular, often filiform outgrowths, the apex entire or sparsely fimbriate, terminating in a small thin-walled cell or a filiform cell, to 0.8 mm long. *Venation* raised or obscure. *Sori* circular, terminal, medial or inframedial on unabbreviated or abbreviated vein branches, discrete at maturity, *c.* 1 mm in diameter: *sporangium* with 9–(14)–20 indurated annulus cells; stalk eglandular; *indusium* peltate, circular to reniform, repand to erose, the maximum radius 0.19–(0.33)–0.5 mm, persistent, brown. *Spores* 64 per sporangium, brown, the perispore folded to form inflated reticulate ridges and tubercles, the ridges and areas between variously perforated, echinate to echinulate, the exospore 30–(37.77)–54 × 22–(27.49)–36 µm. *Chromosome number* unknown.

Material examined

MALAWI: Nyika Plateau, 2250 m, *Brass* 17255 (K, PRE, SRGH); Mount Mulanje, Lichenya Plateau, Nessa Path Forest, 1800 m, *Chapman* 8262 (MAL, PRE); Zomba Plateau, W.-facing cliff edge below Malumbe Peak, 1900 m, *Berrie* 602 (MAL); Zomba Plateau, Malumbe Peak, *Roux* 2928 (NBG); Mulanje Mountains, Lichenya Plateau, *Pawek* 3815 (K); Mount Mulanje, Lichenya Plateau, 1820 m, *Brass* 16566 (K, SRGH); Nyika Plateau, Kasaramba Peak, 8400 ft, *Simon* et al. 1730 (K, SRGH); Mount Mulanje, Lichenya Plateau, 1890 m, *Brass* 16820 (K, SRGH); Mount Mulanje, Lichenya Plateau, 1950 m, *Richards* 16556 (K); Mount Mulanje, Nayawani Forest, 6400 ft, *Newman & Whitmore* 547 (BR, SRGH); Mt. Mulanje, L. Ruo Plateau, 6400 ft, *Newman & Whitmore* 399 (BR).

MOZAMBIQUE: Manica & Sofala, Penhalonga, 4500 ft, *Schelpe* 5325 (BOL); Manica & Sofala, Gorongosa Mountains, Gogogo Peak, 5000 ft, *Schelpe* 5518 (BOL); Manica & Sofala, Gorongosa, Serra da Gorongosa, vertente do monte Nhandare, 1750 m, *Torre & Pereira* 12515 (BOL, BR, SRGH); Namuli, Makua country, *Last* s.n. (K).

TANZANIA: Uluguru Mountains, S. of Bunduki, NE edge of Lukwangule Plateau, on rocky outcrops of Muisile Hill, 2400–2450 m, *Pócs* et al. 86141/A (WAG); W. Usambaras, towards Mount Kwashenhambu, 1850 m, *Schippers* T1578A (WAG); W. Usambara Mountains, N. slopes of Mount Shegein, Shasayo Forest, 1850 m, *Schippers* T1604A (WAG); Morogoro, Ukaguru Mountains in Kilosa District, W. Mamiwa Ridge, 2100–2200 m, *Pócs* et al. 86100/B (WAG); Tanga Region, Lushoto District, W. Usambara Mountains, Shagayu Forest Reserve, NW slope of the summit 2.5 km ENE of Shagayu sawmill, 1850–1950 m, *Borhidi* et al. 84847 (ETH); Morogoro District, Uluguru Mountains, W. part of Lukwangule Plateau, 2400–2500 m, *Harris* et al. 3726 (K); Usagara: Itumba, *Wood* s.n. (K); Uluguru Mountains, above Morogoro, NE ridge of Bondwa between Morningside and Mwere Valley, 1050 m, *Pócs* 6537/C (PlC.SERM.); Uluguru Mountains, NW slope of Bondwa, along road to Morningside, *Faden* et al. 70/654 (BM, BOL); Uluguru Mountains, Morningside to Bondwa, *Faden* 70/316 (BOL, K); mainland W. of Zanzibar, *Last* s.n. (K); N. Uluguru Forest Reserve, Lupunga Peak, W. side, 2000 m, *Hall* s.n. (K); Morogoro: Uluguru gebirge, Lupanga, 2100 m, *Schlieben* 2977 (B, BR).

ZIMBABWE: Inyanga, Pungwe Gorge, 6000 ft, *Schelpe* 5699 (BOL); Inyanga, circular drive on N. rim of Pungwe Gorge, 7000 ft, *Mitchell* 148 (BOL); Umtali, Stapleford Forest Reserve, W. of Rupere Peak, 5500 ft, *Chase* 7429 (BOL, K); Inyanga, *Mitchell* 1082 (BOL, K, NU, SRGH); Umtali, 'Cloudlands', Vumba, 5200 ft, *Schelpe* 5365 (BOL); Inyanga, ad dejectum fluminis Pungwe, *c.* 1700 m, *Fries* et al. 3795 (BOL, K); Umtali District, Vumba Mountains, 'Cloudlands', forest E. of Cripps Grid, *Chase* 8345 (BOL, K); Umtali District, on Lords Head property, Vumba Mountains, 5300 ft, *Chase* 8343, 8344 (BOL, K, SRGH); Melsetter, forest in gully on W. side of N. end of Bundi Valley, *Mitchell* 514 (BOL, K, SRGH); Umtali District, Stapleford Forest Reserve, 5600 ft, *Chase* 8373 (BOL, K, SRGH); Stapleford Forest Reserve, lower part of road to Henkels Nek, 5600 ft, *Chase* 8371 (BOL, SRGH); Umtali District, Vumba Mountains, *Williams* VUM18 (BOL); Vumba Mountains, *Williams* VUM1, VUM10, VUM11, VUM12, VUM13 (BOL); Chimanimani Mountains, Gwasha, *Williams* STP1, STP2 (BOL); Inyanga, 6500 ft, *Chase* 5100 (BOL); Inyanga, Pungwe Gorge, Inyangani Mountains, 6500 ft, *Chase* 5240 (BOL); Umtali, Vumba Mountains below Castle Beacon, 5600 ft, *Chase* 7489 (BOL); Inyanga, circular drive below Inyangani Mountain, 7500 ft, *Mitchell* 135A (BOL); Umtali, Imbeza Forest Estate, Zuwanne indigenous forest, 5150 ft, *Jacobsen* 3838 (BOL, SRGH); Stapleford Forest Station, 6000 ft, *Taylor* 3234 (BOL, SRGH); Vumba Mountains, SE slope of Castle Beacon, 1675 m, *Burrows* 2944, 2945 (PRE); Inyanga, S. tip of Mount Inyangani, 2040 m, *Burrows* 2935 (PRE); Pungwe Gorge, in drier part of ravine, *Schweikerdt* 2412 (M, PRE); Umtali, Vumba, Castle Beacon, 6000 ft, *Fisher* 1638 (NU, PRE); Vumba Mountains, *Chase* 1102 (PRE); W. slope of S. tip of Mount Inyangani, 2000 m, *Burrows* 2940 (PRE); Inyanga, new beacon on Mount Inyangani, 2540 m, *Burrows* 2828 (PRE); Inyanga, montane forest, 6000 ft, *Chase* 4024 (PRE); Vumba Mountains, 5400 ft, *Chase* 8347 (K); Vumba Mountains, Bunga Forest, *Jacobsen* 3037 (SRGH); Inyanga, lower E. slope of Inyangani, *c.* 1480 m, *Müller* 3214 (SRGH); lower SE slope of Mt. Pene, 1350 m, *Müller* 2798 (SRGH); Inyanga, top of escarpment 2 km N. of Honde View, *c.* 1840 m, *Müller* 3243 (SRGH); Melsetter, Chimanimani, Bundi River, 5500 ft, *Whellan* 2184 (SRGH); Vumba Mountains, forest on E. slope of Castle Mountain, *Jacobsen* 3033 (SRGH); Stapleford Forest Reserve, Ruperi Peak, 6100 ft, *Chase* 4656 (SRGH); Stapleford Estate, montane forest, *Roux* 2828 (NBG); SE edge of Vumba Hotel forest, *Chase* 4022 (SRGH); Stapleford Forest Reserve, *Chase* 8372 (SRGH); Melsetter District, Orange Grove, *Chase* 3088 (BR, NU, S, SRGH); Inyanga District, source of Inyahupina River, Romneydale, 6100 ft, *Chase* 2089 (NU, SRGH); 30 miles S. of Umtali, 6000 ft, *Grout* 33 (NU); Umtali, Pioneer farm, *Fisher & Schweickerdt* 306 (NU); Umtali District, Vumba Mountains, Natseland, *Chase* 3428 (NU); Umtali District, Nyagari farm, N. of Zwitembo, *Chase* 3156 (NU); Inyanga District, *Chase* 3206 (NU); Inyanga District, Pungwe Falls, 6000 ft, *Chase* 3197 (NU); Umtali District, Stapleford Forest Reserve, *Chase* 4520 (NU); Umtali District, Penhalonga, *Chase* 3132 (NU); Inyanga, Pungwe view point, *Chase* 3206 (NU); Umtali, *Chase* s.n. (NU); a 15 km à l'E. d'Inyanga, sommet du mont Mimunzi, 18°14'S, 32°53'E, 1950 m, *Bamps* et al. 272 (BR); Vumba Mountains, Umtali District, Cloudlands, *Jackson* 8 (GRA).

Diagnostic features and relationships. *Polystichum zambesiacum* can be easily recognized among African members of the genus by its long and narrow rugose rhizome paleae, long-attenuate pinnae and (although variable) obtuse pinnule lobes, conspicuously small indusia, and the palea morphology.

Polystichum zambesiacum is not considered to be related to any other taxon in the study area.

VARIATION. Schippers (1993) suggested that the Tanzanian plants may be a different but related species to *Polystichum zambesiacum*. He noted the Usambara Mountain plant to differ from that of the southern highlands in the more shiny fronds, the more deeply divided pinnae, and the segment margins having more clearly aristate teeth. *Polystichum zambesiacum* is clearly a very variable taxon with lamina division ranging between 2-pinnate and 3-pinnate. Most apparent is the degree to which the size, shape and incision of the pinnules vary. This, however, cannot be linked to distribution as 3-pinnate plants have been recorded from the Pungwe Gorge in Zimbabwe [*Chase* 5240 (BOL)] and the Ukagura Mountains in Tanzania [*Pócs* et al. 86100/B (WAG)]. In the Uluguru Mountains, like in the rest of its distribution, the pinnules are mostly variously incised and lobate-dentate to ovate-serrate. One collection from this region [*Faden* et al. 70/316 (BOL, K)] shows hardly any incision of the pinnules which are poorly lobate. Lamina division can thus not be considered in subdividing the taxon. In some plants the proximal pinnule of the basal pinnae is reduced in size and thus not auriculate as the distal pinnae. The basiscopic pinnules of these pinnae are often more significantly reduced than the acroscopic pinnules. In others, however, the pinnules show no reduction of size on the lower pinnae.

Stipe paleae also show variation. In some plants the larger paleae are variously impregnated with the central part of the paleae often dark brown to black and nitid with a narrow membranous margin. These paleae are generally persistent for a long time, resulting in the non-impregnated margin being worn away. In others the paleae are reddish brown and remain membranous.

DISTRIBUTION AND ECOLOGY. *Polystichum zambesiacum* ranges from the eastern highlands of Zimbabwe and adjacent Mozambique to Mount Mulanje and the Nyika Plateau in Malawi and the Uluguru, Usambara and Pare Mountains in Tanzania.

Polystichum zambesiacum is a terrestrial or epilithic species occurring in high-altitude, evergreen, montane mist forests, along forest margins and streambanks in forests. It has been reported on Mount Inyangani, Zimbabwe, from open montane grassland, and in the Uluguru Mountains from rock outcrops.

Being a high altitude species, *Polystichum zambesiacum* is restricted to the often isolated high mountains of east Africa. In Zimbabwe and Mozambique it is confined to the Chimanimani and Nyanga Mountain ranges occurring between 1370 and 2540 m. In Malawi the fern is only known from Mount Mulanje in the south (1800–1950 m) and the Nyika Plateau in the north where it occurs between 1800 and 2550 m. In the Uluguru Mountains, Tanzania, it occurs at elevations ranging between 1050 and 2500 m. Further north, in the Usambara and Pare Mountains it occurs at 1850 to 1950 m, but is reported to be rare (Schippers, 1993).

14. **Polystichum monticola** N.C. Anthony & Schelpe in *Bothalia* **15**: 554 (1985); *Fl. Sthn. Afr., Pterid.*: 257 (1986); Burrows, *Sthn. Afr. ferns and fern allies*: 314, f. 75, t. 320a-c (1990). Type: Cape Peninsula, Table Mountain, Dark Gorge, below saddle SE side, sheltered gully, dry in summer, on steep rocky slopes, *Esterhuysen* 26685 (BOL!-holotype; B, C, CHR, G, GH, K, M, MO, NBG!, NU, P, PR, PRE!-isotypes).

Fig. 14.

Plants terrestrial or epilithic. *Rhizome* short-decumbent, closely branched, to 14 mm in diameter, set with roots, crowded persistent stipe bases, and paleae; paleae broadly attached, ferrugineous, membranous, narrowly oblong to narrowly linear, cordate, the margins entire or with widely spaced, short, apically or basally directed outgrowths, the apex acicular or with a thin-walled apical cell, to 26 × 1.8 mm. *Fronds* closely spaced, 5–8 per plant, suberect to arching, to 840 mm long: *stipe* proximally castaneous, stramineous distally, adaxially sulcate, to 385 mm long, to 5 mm in diameter, densely paleated; larger paleae broadly attached, concolorous or bicolorous, stramineous or with a castaneous central section, these occurring on the proximal third of the stipe, lanceolate to broadly ovate, cordate to cordate-imbricate, the margins with closely to widely spaced, short, straight or curved, often branched fimbriae, the apex acicular or with a thin-walled apical cell, to 20 × 7 mm; smaller paleae short-stalked, narrowly lanceolate to narrowly triangular, cordate to cordate-imbricate, the margins proximally with closely spaced, short and long, often branched fimbriae, the apex entire or with short, firm, widely spaced fimbriae terminating in an acicular cell or with a thin-walled cell: *lamina* 2-pinnate to 2-pinnate-pinnatifid, firmly herbaceous, dark green adaxially, paler abaxially, narrowly ovate to elliptic, to 510 mm long, proximally somewhat reduced, the proximal pinnae usually somewhat deflexed: *rachis* stramineous, adaxially sulcate, densely paleated; paleae short-stalked, ferrugineous, chartaceous, narrowly lanceolate, narrowly ovate or narrowly triangular, cordate to cordate-imbricate, the margins proximally with long and short, straight or twisted marginal outgrowths becoming simple towards the apex, the apex usually acicular, rarely terminating in a thin-walled apical cell, to 11.5 × 2.5 mm: *pinnae* often widely spaced proximally, somewhat overlapping distally, oblong-attenuate to narrowly oblong-attenuate, to 170 × 30 mm: *pinna-rachis* stramineous, adaxially sulcate, densely set with paleae similar to but smaller than those on the rachis, to 7 × 1.5 mm: *pinnules* opposite to alternate, closely spaced, often imbricate, asymmetric, narrowly ovate to ovate, acroscopically auricled, serrate to lobate-serrate, sharp-tipped to aristate, the proximal acroscopic pinnule the largest, the proximal pinnules often acroscopically incised to or near to costa, to 22 mm long; adaxially with a few simple and filiform or proximally hastate paleae along the proximal part of the costa, the apical cell always acicular, to 4.5 mm long; abaxially sparsely set with ferrugineous, short-stalked, narrowly triangular to subulate paleae, proximally usually with a few short or long, straight or curved outgrowths, the apical cell always acicular, to 4 × 0.9 mm long. *Venation* immersed. *Sori* circular, *c.* 1.5 mm in diameter, essentially uniseriate, terminal or near terminal on abbreviated vein branches: *sporangium* with 7–(12)–21 indurated annulus cells; stalk eglandular: *indusium* stramineous to castaneous, often black-centred, peltate, circular, entire to repand, the maximum radius 0.31–(0.61)–1.04 mm, persistent. *Spores* brown, 32 per sporangium, the perispore variable, folded to form a reticulum of inflated or compressed ridges and/or tubercles, the crests and areas between echinulate to spiculate, the areas between ridges perforated, the exospore 38–(59.07)–74 × 22–(43.76)–60 µm. *Chromosome number* 2n=246, apogamous.

MATERIAL EXAMINED

LESOTHO. 2828 (Bethlehem): Leribe (CC), *Dieterlen* 167, in part (B); Mafeteng, Mont Ka-majapela, *Dieterlen* s.n. (BR); Leribe, 5000–6000 ft, *Dieterlen* 695 (NBG, PRE, SAM). **2927 (Maseru)**: Mamathes District, 5850 ft (BB), *Guillarmod* 835 (PRE); Roma, 5550 ft (BC), *Ruch* 1909 B-only (PRE); Roma, W. ravine, *Schmitz* 399 (PRE); Roma, SE-facing slope, *Schmitz* 402 (PRE), Roma, *Schmitz* 6888 (PRE); Morija (DA), *Dieterlen* 1309 A-only (PRE). **2929 (Underberg)**: Sehlabathebe National Park, Mofoqoi, 2350 m, *Hoener* 1479 (BOL).

SOUTH AFRICA. 2730 (Vryheid): Hlobane, *Johnstone* 295 (NH). **2828 (Bethlehem)**: Clarens, mountain N. of Leibrandt Kloof (CB), *Roux* 937 (NBG); Golden Gate National Park, NE of Glen Reenen Camp, 6200 ft (DA), *Liebenberg* 7498 (PRE); Golden Gate National Park, Wonderhoek, *Gertenbach & Groenewald* 9167 (PRE); Golden Gate National Park, *Roberts* 3235 (PRE); Golden Gate National Park, *Rossouw* 406 (BOL); N. of Montaux-Sources, Witsieshoek area, 1800 m (DB), *Junod* 14 (P); Royal Natal

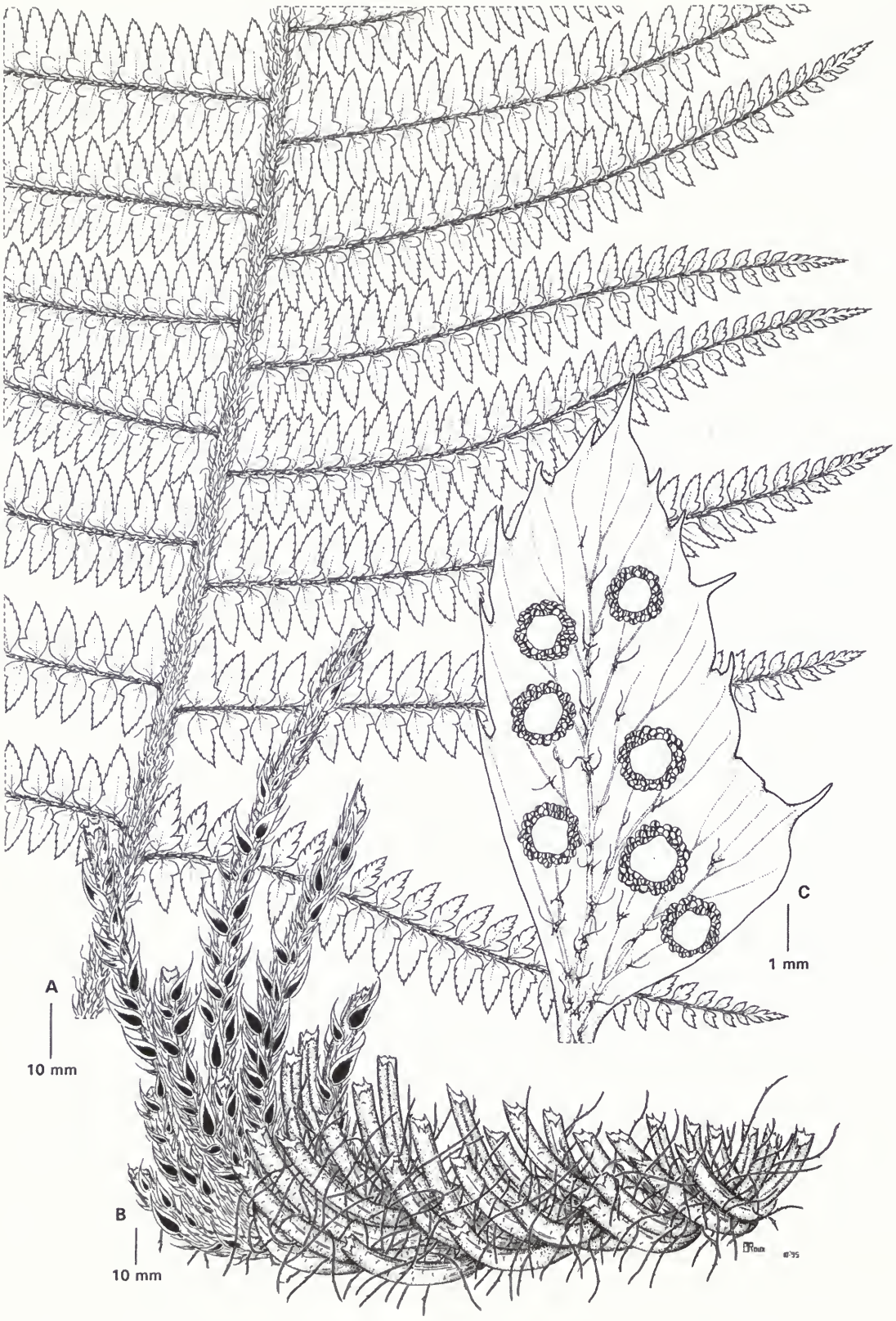

Fig. 14 *Polystichum monticola*. A, proximal part of lamina; B, rhizome; C, abaxial surface of fertile pinnule. A, B, drawn from *Roux* 2581 (NBG); C, drawn from *Van Jaarsveld* 6494 (NBG).

National Park, Gudu Forest, *Edwards* 325 (NU, PRE); Royal Natal National Park, Gudu Forest, *Roux* 2513 (NBG); shady gully on the Lion facing the Tugelana Valley, *c.* 6300 ft, *Esterhuysen* 35645 (B, BOL, NBG, NU, PRE); Witsieshoek, 6000–7000 ft, *Thode* s.n. (NBG); Royal Natal National Park, Gudu Forest, 5000 ft, *Schelpe* 1455 (NU); Mont-aux-Sources, *Bottomley* s.n. (PRE); Mont-aux-Sources, Tugela River, near gorge, *Hutchinson* 41 (PRE); Mont-aux-Sources, *Schweickerdt* 760B (PRE); Royal Natal National Park, *West* 1284 (PRE); Quaqua mountains, Lefika, *Rustenberg* s.n. (P); versant N. du Mont-aux-Sources, region de Witsies Hoek, *c.* 1800 m, *Junod* 14 (P). **2829 (Harrismith)**: Swinburne, Boschhoek, E. slope of Manyenyeza (AC), *Jacobsz* 4711 (PRE); Harrismith, Platberg, valley below Monkey Point, *Roux* 2520 (NBG); Platberg, 1600 m, *NBG Exped.* s.n. (BOL); Harrismith, Platberg, 1600 m, sine coll. 151191 (NBG); Harrismith, Platberg, dolerite cliffs left of summit of Donkey's Pass, *Roux* 2528 (NBG); Platberg, in shade of concrete furrow leading to Hawkins Dam, 2220 m, *Roux* 2527 (NBG); Harrismith, Platberg, *Roux* 2523 (NBG); Harrismith, Kerkenberg, *Schelpe* 7278 (BOL); Cathedral Peak area, nKdhlanhla Forest, *Schelpe* p.47 (NU); Cathedral Peak area, 5000 ft, *Brass* 76 (NU); Cathedral Peak area, Indumeni Forest, 5100 ft, *Schelpe* 737 (NU); Van Reenen, 6800 ft (AD), *Schlechter* 6932 (B, NBG, PRE); Oliviershoek Pass, forests S. of Seheletwane (CA), *Roux* 2518 (NBG); Oliviershoek, 6000–7000 ft, *Thode* s.n. (NBG); Cathedral Peak Hotel, along Cathedral Peak path, 1500 m (CC), *Goetghebeur* 4563 (BR, PRE); Cathedral Peak area, *Brass* 67, 79, 82, 96, 98 (NU); Cathedral Peak Forest Station, 6050 ft, *Killick* 1134 (NU); Cathedral Peak area, 2000–3000 ft, *Wilker* 69 (NU); Drakensberg, MnWeni Pass, *c.* 8500–9000 ft, *Esterhuysen* 27830 (PRE). **2831 (Nkanhla)**: Ngoye, 2–3000 ft (DC), *Medley-Wood* 10886 (PRE). **2926 (Bloemfontein)**: Thaba 'Nchu Mountain, 6500 ft (BB), *Roberts* 2998 (PRE). **2929 (Underberg)**: Giants Castle Nature Reserve, forests above Hillside campsite, c. 1600 m (AB), *Roux* 2499, 2501, 2506, 2507 (NBG); Injasuti area, 5000 ft, *Esterhuysen* 26041 (BOL); Kamberg area, Storms Heights, *c.* 7000 ft (BC), *Hilliard & Burtt* 11795 (NU, PRE); Mpendhle District, Mulangane Ridge, above Carter's Nek, 7000–7300 ft, *Hilliard & Burtt* 16951 (BOL); 18406 (NBG, PRE); Kamberg, 'Game Pass', 6100 ft, *Gordon-Gray* 85 (NU); Drakensberg Garden State Forest Reserve, near Mlambonja River (CA), *Van Jaarsveld* 6492, 6494 (NBG); Drakensberg Gardens, 6000 ft, *Bronhead* 59 (NU); Drakensberg Gardens, *Dyer* 73 (NU); Drakensberg Garden area, 6000 ft, *Schelpe* p54 (NU); Drakensberg Garden Hotel, up to Rhino Peak, along Mlambonja River, 2000 m, *Goetghebeur* 4519 (BR, PRE); Gxalingenwa Valley between Sani Pass and Polela Valley, *c.* 6700 ft (CB), *Hilliard & Burtt* 17076 (NU, PRE); Cobham Forest Station, Ndlovini, Troutbeck, *c.* 6000 ft, *Hilliard & Burtt* 13311 (NU), 13329 (BOL, NU); Cobham Forest Reserve, Sipongweni, 6500 ft, *Hilliard & Burtt* 14135 (BOL, NU, PRE); Cobham Forest Reserve, 'Lakes' Cave area, *c.* 7800 ft, *Manning* et al. 15918 (BOL, NU); Garden Castle area, 9000 ft (CD), *Crooked* 62 (NU); Garden Castle area, *Elliott* 31 (NH), 37 (NU); Boston, Impendhle, 5000 ft (DB), *Randles* 185 (NU); Impendhle, 5200 ft, *Clarkson* 133 (NU); Impendhle, *c.* 5000 ft, *Huntley* 167 (NU); Bulwer, Marwaga Mountain, farm Sunset, 1810 m (DC), *Roux* 2309 (NBG); Farm Sunset, 5800 ft, *Rennie* 1441 (NU, PRE); Himeville District, 5000 ft, *Webb* 101 (NU); Farm Sunset, gully above dams, 6000 ft, *Rennie* 1055 (NU); Polela District, near Bulwer (DD), *Henkel* s.n. (NU); Bulwer, 5100 ft, *Clarkson* 182 (NH, NU, PRE); Bulwer, *Allsopp* 843 (NU). **2930 (Pietermaritzburg)**: Zwaartkop (CB), *Sim* s.n. (NU, PRE). **3018 (Kamiesberg)**: Kamiesberg, Rooiberg, 5500 ft (AC), *Rourke* 1684 (BOL, NBG, PRE); Rooiberg, farm Damsland, *Roux* 2453 (NBG). **3027 (Lady Grey)**: Herschel District, Majuba Nek, *Hepburn* 262, B-only (GRA). **3028 (Matatiele)**: Ongeluks Nek, *c.* 4 km from Lesotho border post, 2250 m (AB), *Matthews* 916 (NBG). **3029 (Kokstad)**: Mt. Currie, farm Highland Home (AB), *Roux* 2488, 2490 (NBG); Mt. Currie, *Edwards* 214a (NU); Mt. Currie, 5200 ft, *Edwards* 44 (NU); Kokstad (CB), *Mogg* 1927 (PRE). **3030 (Port Shepstone)**: Ixopo (AA), *Hancock* s.n. (NU). **3124 (Hanover)**: Compassberg, near top, *c.* 2440 m. (DC), *Trollip* s.n. (PRE); top of Compassberg, *Coetzee* s.n. (PRE); Compassberg, farm Grootkop, 6300 ft, *Acocks* 23447 (PRE). **3126 (Queenstown)**: Broughton, near Molteno (AD), *Flanagan* s.n. (SAM); Broughton near Molteno, *Flanagan* 1681 (PRE); Broughton, Molteno, 6300 ft, *Flanagan* 527 (PRE); Queenstown, Hangklip Mountain, 6600 ft (DD), *Roberts* 2012 (PRE). **3128 (Umtata)**: Maclear, farm Woodcliffs (AB), *Roux* 2481, 2484, 2485 (NBG). **3218 (Clanwilliam)**: Clanwilliam Division, between Tafelberg and Spout, 6000 ft (BB), *Schelpe* 1960 (BOL, K). **3219 (Wuppertal)**: Gideon's Kop, 1500 m (CB), *Burrows* 1235 (BOL). **3224 (Graaff-Reinet)**: Mount Oudeberg near Graaff-Reinet (DD), *sine coll.* 96897 (B); in fissuris rupium in monte Oudeberg prope Graaff-Reinet, 4800 ft, *Bolus* 1736 (BOL, K). **3225 (Somerset East)**: Montis Boschberg (DA), *MacOwen* 870 (BR). **3226 (Fort Beaufort)**: Katberg, 3500–4000 ft (BC), *Baur* 865 (B, GRA); Katberg Pass summit, farm Pleasant View, *Roux* 2697 (NBG); Hogsback, Elandsberg summit (DB); *Roux* 2688 (NBG); Hogsback, Zincucha Forest, *Roux* 2683 (NBG). **3318 (Cape Town)**: in numerosis umbrosis montis Tafelberg, Paradys (CD), *MacOwen* s.n. (P); Table Mountain, Dark Gorge, below Saddle, SE side, *Esterhuysen* 26563 (B, BOL, PRE); Stellenbosch, Jonkershoek, Langrivierkloof (DD), *Roux* 2580, 2581, 2582, 2583 (NBG); Stellenbosch, Simonsberg, 3000 ft, *Esterhuysen* 25453 (BOL); Stellenbosch, Helderberg, Disa Gorge, *Esterhuysen* 28475 (BOL). **3319 (Worcester)**: Great Winterhoek Mountains, 4000–5000 ft (AA), *Esterhuysen* 26982 (B, BOL, NBG, PRE); Tulbagh, W. slopes of Swartgat Peak, Witzenberge, 4000 ft (AC), *Esterhuysen* 16914 (BOL, NBG); Tulbagh, Great Winterhoek Mountains, 5500 ft, *Esterhuysen* 19787 (BOL, NBG); Ceres, Baviaansberg (BA), *Stokoe* s.n. (NBG, SAM); shale band below Milner Peak, Hex River Mountains, 5000 ft (AD), *Esterhuysen* 14264 (BOL), 14885 (BOL, NBG); Milner Ridge Peak and Buffels Dome, 5000 ft, *Esterhuysen* 28708B (BOL); Ceres, Slab Peak, 1310 m, *Winter* 431 (NBG); Hex River Mountains, Moraine Kloof, *c.* 4000 ft, *Ashton* 352 (BOL); Goudini, Waaihoek Mountains, 4000 ft (CB), *Barnard* s.n. (SAM). **3320 (Montagu)**: Boesmansbos (DD), *Adamson* s.n. (BOL). **3321 (Ladismith)**: Swartberg, near Ladismith, Toverkop, 6500 ft (AC), *Esterhuysen* 26698 (B, BOL, NBG, NU, PRE); below Toverkop on S. slope of Swartberg, 5000–6000 ft, *Esterhuysen* 14013 (BOL, PRE); cliffs at base of Toverkop, 6500 ft, *Esterhuysen* 18511 (BOL). **3322 (Oudtshoorn)**: Prince Albert Division, Swartberg Mountains (AC), *Stokoe* 9410 (NBG, SAM); Prince Albert, *Popta* s.n. (L); Blesberg, 6000 ft (BC), *Esterhuysen* 24920 (BOL); Montagu Pass (CD), *Schweickerdt* 4705 (PRE); Kammanassie Mountains, Mannetjiesberg, 4200 ft (DB), *Matthews* 1023 (NBG); S. slope of Mannetjiesberg, Kammanassie Mts, 5000 ft, *Esterhuysen* 18396 (BOL). **3323 (Willowmore)**: Hoopsberg, S. slope, 5000 ft (CB), *Esterhuysen* 6557 (BOL). **3324 (Steytlerville)**: S. slopes of Kouga Peak near Joubertina (CA), *Esterhuysen* 16280 (BOL, NBG); Uitenhage, Cockscomb, Great Winterhoek mountains, 4800 ft (DB), *Esterhuysen* 27090 (BOL, PRE).

ZIMBABWE: Victoria Falls, *Sim* s.n. (PRE).

WITHOUT EXACT LOCALITY: Orange Free State, Wittebergen, ad Caledonrivier, *Rehmann* 3938, 3978 (B); Natal, *sine coll.* s.n. (NBG); Blinkwater Bush, *Graham* 84 (NU); Transvaal, *Repton* 5B (PRE); in summo monte Koudveld, 6500 ft, *Tyson* 140 (PRE); in sylvis umbrosis faecium montium Hott. Holland., *sine coll.* 341 (S); Malappa's Place, *Rustenberg* s.n. (P); Natal, *sine coll.* s.n. (BR); Basotholand, *Koopowitz* s.n. (GRA); Bushmans Cave, *Lubke* s.n. (GRA).

DIAGNOSTIC FEATURES AND RELATIONSHIPS. *Polystichum monticola* is characterized by its largely montane habitat, the usually large stands it forms, the short decumbent rhizome clothed by long, narrowly linear to cuspidate paleae, the closely spaced, firmly herbaceous fronds, smallish pinnules, bicolorous larger paleae on the proximal part of the stipe, short-stalked paleae with proximal margins that bear stiff, often branched outgrowths, and with an apical cell that is not thin-walled, the relatively large repand to entire, persistent indusia, the 32 spores borne by each sporangium, and the somatic chromosome number of 2n=246.

In palea morphology *Polystichum monticola* exhibits features of sections *Lasiopolystichum* and *Metapolystichum*. Both of these sections are characterized by short, unbranched, suberect to erect rhizomes resulting in the plants growing as individuals. In *P. monticola*, however, the rhizome is decumbent and mostly repeatedly branched: as a result plants form large clonal stands. In spore morphology it is closer to section *Metapolystichum* than to section *Lasiopolystichum*.

VARIATION. Depending on habitat, *Polystichum monticola* shows considerable variation in frond size, lamina texture, pinnae arrangement and pinnule size. Plants from xeric habitats have short fronds with closely spaced pinnae and small imbricate pinnules that are

firm-herbaceous in texture. Some collections proved to have unusually large indusia, with a maximum radius up to 1.04 mm having been measured on a plant from Milner Peak in the Hex River Mountains [*Esterhuysen* 14885 (NBG, BOL)]. Indusia of the type collection are unusually small with the mean radius being merely 0.36 mm (n=6). Collections with these unusually large indusia occur at random throughout the distribution of the species and cannot be ascribed to any environmental condition. The same pattern applies to the often black-centred indusia. Although the number of indurated annulus cells per sporangium is relatively uniform in the species, unusually low and high numbers have been recorded. A plant from Leribe, Lesotho [*Dieterlen* 695 (SAM)] has sporangia with the number of indurated annulus cells varying between 7 and 13 (x=10.66; n=50), whereas a plant from Platberg, Harrismith [*Roux* 2523 (NBG)] has sporangia with the number of indurated annulus cells varying between 13 and 17 (x=14.7; n=50). Plants from forest habitats generally have larger fronds that are softer in texture to those occurring in more exposed habitats where the fronds are smaller and firm-herbaceous to subcoriaceous.

DISTRIBUTION AND ECOLOGY. *Polystichum monticola* is confined to southern Africa where it has been recorded from the Northern Cape, Western Cape, Eastern Cape, KwaZulu-Natal and Free State, as well as in Lesotho, with one isolated record from the Victoria Falls in Zimbabwe that needs to be confirmed. The species is largely confined to the mountains ranging from the Cape Peninsula, along the southern Cape mountains to the Drakensberg Escarpment as far north as Platberg in the northeastern Free State. Plants have also been recorded from outlying locations such as the Kamiesberg in the Northern Cape Province and from Thaba 'Nchu Mountain in the eastern Free State. This apomictic taxon occurs at elevations ranging from 600 to 2740 m in often xeric environments. The habitat includes rock crevices in screes, cliff bases, streambanks, forest margins and forest floors. Often growing in exposed habitats where it forms large masses, the species is frequently exposed to veld fires, from which it soon recovers.

15. **Polystichum dracomontanum** Schelpe & N.C. Anthony in *Contr. Bolus Herb.* **10**: 145 (1982). Type: Natal, Bergville Division, on banks above stream in side kloof west of main kloof, shortly above the Singati Cave (E. of Mont-aux-Sources), in unburnt sparse bush or small trees or in the open, *c.* 6000 ft, *Esterhuysen* 35646 (BOL!-holotype; B!, BOL!, C, GH, K, M, MO, NU!, P, PRE!, S-isotypes).

Fig. 15.

Plants terrestrial or epilithic. *Rhizome* decumbent, stoloniferous, to 10 mm in diameter, densely set with roots, persistent stipe bases, and paleae; paleae ferrugineous, broadly attached, chartaceous, linear-attenuate, entire, the apex terminating in a small thin-walled cell, to 28 × 2 mm. *Fronds* closely spaced, 5–7 per plant, erect or arching, to 1.15 m long: *stipe* proximally castaneous, stramineous distally, adaxially sulcate, to 540 mm long × 6 mm in diameter, initially densely paleated, becoming glabrous with age, proximally with paleae similar to those on the rhizome, the paleae distally of two types; larger paleae broadly attached, ferrugineous to castaneous throughout or stramineous to ferrugineous with a castaneous central region or apex, chartaceous, narrowly ovate to ovate, cordate, the margins with short, straight or curved projections, the apex often flagelliform, terminating in a thin-walled cell, to 25 × 6 mm; smaller paleae ferrugineous to stramineous, membranous, narrowly ovate to lanceolate, cordate to cordate-imbricate, the margins closely set with short and/or long, straight or curved, often branched outgrowths, the apex flagelliform, acicular or terminating in an oblong to clavate thin-walled cell, to 11.5 × 1.8 mm: *lamina* 2-pinnate to 2-pinnate-pinnatifid, with up to 24 free pinna pairs, ovate, to 610 mm long: *rachis* stramineous to greenish, adaxialy sulcate, initially densely paleated; paleae short-stalked, membranous, narrowly lanceolate to narrowly ovate, cordate to cordate-imbricate, the margins proximally with long and/or short, straight or curved, often branched outgrowths, the apex acicular or flagelliform and terminating in a thin-walled cell, to 7.3 × 1.6 mm: *pinnae* proximally short-stalked, 1-pinnate to 1-pinnate-pinnatifid, with up to 18 free pinnule pairs, proximally widely spaced, often slightly reduced, distally often overlapping, ovate to narrowly ovate, to 105 mm long: *pinna-rachis* stramineous, adaxially sulcate, initially densely paleated; paleae stramineous, membranous, narrowly oblong to narrowly triangular, cordate to cordate-imbricate, the margins proximally with long and/or short, curved, often branched outgrowths, the apex acicular, to 9.75 × 2 mm: *pinnules* opposite to alternate, firmly herbaceous to coriaceous, dark green adaxially, paler abaxially, proximally widely spaced to imbricate, asymmetric, ovate to ovate-rhomboid, often somewhat falcate, acroscopically auricled, serrate to doubly-serrate, sharp-tipped to strongly aristate, the margins somewhat revolute, the proximal acroscopic pinnule usually slightly longer than the next, to 22 mm long; adaxially glabrous or with a few stramineous, membranous, filiform, acicular paleae along proximal part of the costa, to 9.5 mm long, abaxially sparsely paleated; paleae short-stalked, stramineous, membranous, filiform, narrowly oblong to narrowly triangular, cordate, the margins proximally with short and/or long, straight or curved outgrowths, the apex terminating in an acicular cell or with a thin-walled cell, to 8 mm long. *Venation* immersed or raised. *Sori* circular, *c.* 2 mm in diameter, terminal or near-terminal on abbreviated vein branches, uniseriate, discrete to confluent at maturity: *sporangium* with 10–(13)–21 indurated annulus cells; stalk eglandular: *indusium* ferrugineous to stramineous, chartaceous, persistent, peltate, circular, with or without central processes, repand to weakly erose, the maximum radius 0.63–(0.81)–1.09 mm. *Spores* 64 per sporangium, brown, the perispore globose or folded to form inflated or narrow reticulate ridges, minutely and sparsely perforated, the ridges and areas between echinate to echinulate, the exospore 25–(54.24)–70 × 28–(41.04)–58 µm. *Chromosome number* unknown.

MATERIAL EXAMINED

LESOTHO. 2927 (Maseru): pente de la montagne de Mathatha district de Mafeteng (CC), *Dieterlen* s.n. (P).

SOUTH AFRICA. 2828 (Bethlehem): Tugela Gorge above chain ladder, 6200 ft (DB), *Hilliard & Burtt* 15445 (BOL, NU); Royal Natal National Park, Tugela Gorge, scrub above chain ladder, *Roux* 2715 (NBG); tributary flowing into the Singati, E. of Mont-aux-Sources (DD), *Esterhuysen* 35644 (B, BOL, NBG, PRE); Bergville, Mont-aux-Sources, *Schweickerdt* 760 (PRE); Mbunduni (MnWeni area), 9000 ft, *Esterhuysen* 27811 (BOL); MnWeni Pass, 8000 ft, *Esterhuysen* 27839 (BOL, PRE). **2829 (Harrismith)**: Farm Bosch Hoek (AD), *Roux* 896, 897, 898 (NBG); MnWeni area, foot of Rockies Pass, 5500 ft, (CB), *Esterhuysen* 21656 (BOL); Rockies Pass, 8000 ft, *Edwards* 2145 (NU); Cathedral Peak area, shady side of kloof (CC), *Esterhuysen* 15486 (BOL, NBG); Cathedral Peak, sheltered slopes below Cleft Peak, 8000 ft, *Esterhuysen* 10199a (BOL, PRE); between Cathedral Peak and Royal Natal National Park, MnWeni Pass, 9000 ft, *Edwards* 851 (NU, PRE); SE slope of The Camel, 8700 ft, *Everson* 73, 74 (BOL); NE facing slope of The Camel, 8700 ft, *Everson* 75, 76 (BOL); Bergville, Orange Peel Gap, 7200 ft, *Everson* 71, 72 (BOL); NE slope of The Camel, 7000 ft, *Schelpe* 756 (NU); Orange Peel Gap, 2420 m, *Crouch* 647 (NU); Cathedral Peak, *Nixon* s.n. (NU); Cathedral Peak area, Umbonbonja River, 6000 ft, *Schelpe* 1096 (NU). **2929 (Underberg)**: Injasuti Valley, Solitude (AB), *Malan* 7 (BOL, NBG); Injasuti Nature Reserve, *Leucosidea* scrub at campsite, *Roux* 2721 (NBG); Ndedema Valley, 6000 ft, *Noel* 1281 (GRA); Injasuti

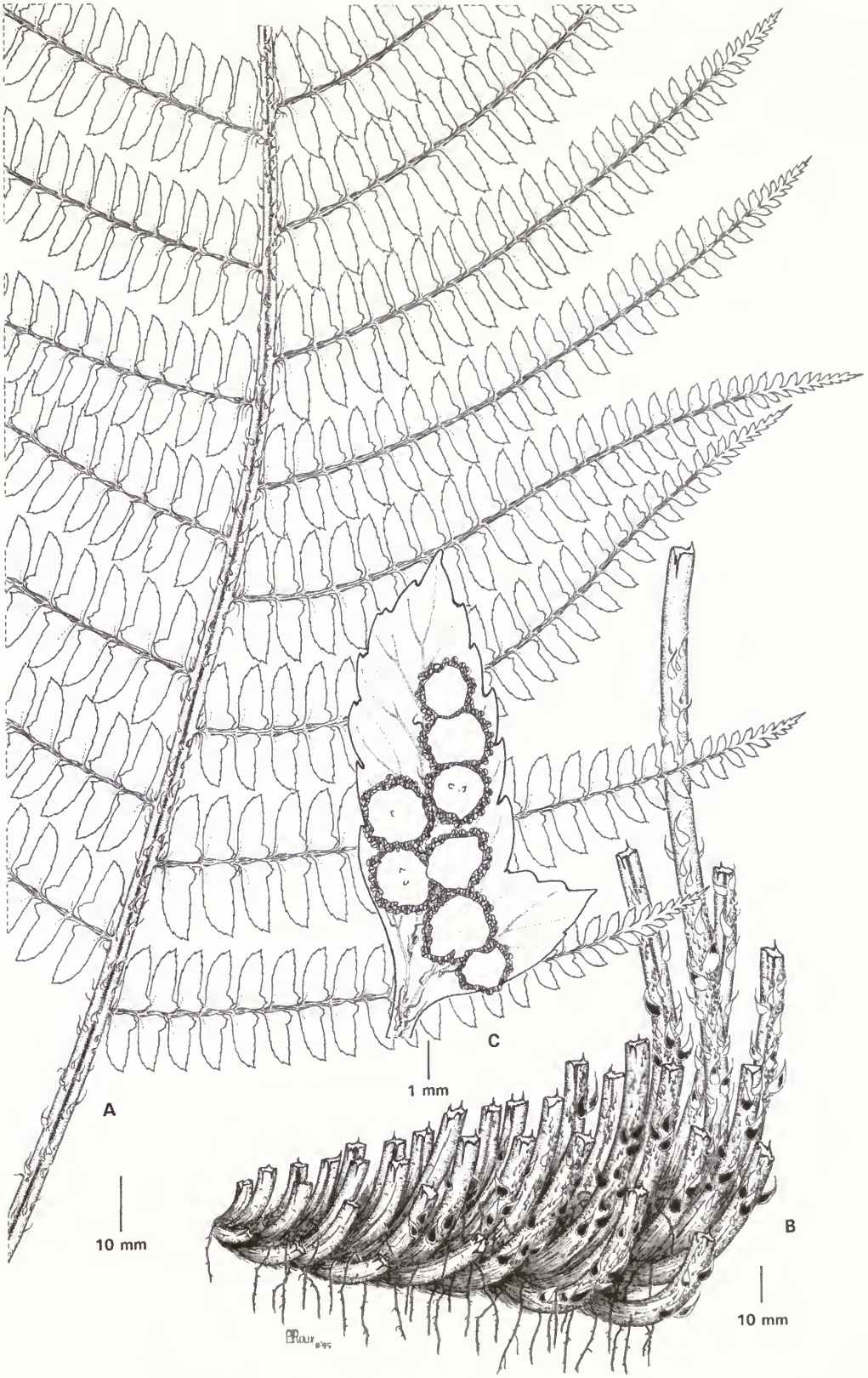

Fig. 15 *Polystichum dracomontanum.* A, proximal part of lamina; B, rhizome; C, fertile pinnule. All drawn from *Esterhuysen* 35646 (BOL).

area, 6500 ft, *Esterhuysen* 35219 (BOL); Injasuti area, 6500–8000 ft, *Esterhuysen* 26039 (BOL); Injasuti area, 7000 ft, *Esterhuysen* 26050 (K); Tabamhlope Mountain, 6000 ft (BA), *West* 184 (PRE); Mulangane Ridge, above Carter's Nek, 7000–7300 ft (BC), *Hilliard & Burtt* 17032, 17529 (BOL, NU, PRE); 5–7 miles NNW of farm Castle View, headwaters of Mlahlangubo River, 6700 ft (CB), *Hilliard & Burtt* 15188 (BOL, K, NU); Cathedral Peak, Ndumeni Valley, 1950 m (CC), *Farrell* 21 (NH).

DIAGNOSTIC FEATURES AND RELATIONSHIPS. *Polystichum dracomontanum* may be confused with *P. monticola*, which occurs in the same region and often in similar habitats. It can, however, be separated from it in the decumbent rhizome that produces slender stoloniferous branches, in the stipe that becomes near glabrous with age, and in the ovate lamina. Other diagnostic features are the entire rhizome paleae that evidently always terminate in a short thin-walled cell, in contrast to the often acicular apical cell in *P. monticola.* Paleae from the stipe, rachis, pinna-rachis and abaxial lamina surface appear to terminate more often in a thin-walled cell in contrast to those of *P. monticola*, where the apical cell appears to be largely acicular. The adaxial surface of the pinnules is largely glabrous but a few filiform paleae may occur proximally along the costa. These paleae always terminate in an acicular apical cell. Paleae from the abaxial surface of the pinnules largely terminate in an acicular apex, but paleae terminating in a short thin-walled cell are not unknown. The smaller paleae in *P. dracomontanum* are stramineous and membranous. The coriaceous lamina and somewhat revolute pinnule margins are also diagnostic. Micromorphological characters separating *P. dracomontanum* from other taxa are the small, almost square, adaxial epidermal cells with almost straight anticlinal walls and the almost circular stomata that are visible at a ×12 magnification. Considering the rhizome and palea morphology, *P. dracomontanum* is allied to the *P. pungens* group of species.

VARIATION. Relatively little variation occurs within the species. Variation was observed in the colour of the larger stipe paleae. In most cases they are stramineous to ferrugineous throughout, but in a few collections they are centrally castaneous with a narrow stramineous margin. The paleae also show some variation in that some terminate in a long acicular cell whereas others may terminate in a short, thin-walled cell. Pinnules vary in size and in the margins that may be sharp-tipped to aristate.

DISTRIBUTION AND ECOLOGY. *Polystichum dracomontanum* is largely confined to the northern Drakensberg Escarpment between Lesotho and KwaZulu-Natal where it occurs on both the lower Clarens Sandstone and the upper basalt formations. The species also occurs further northwards along the escarpment between the Free State and KwaZulu-Natal. Isolated populations have also been reported from the Mafeteng District in southeastern Lesotho. It occurs at elevations ranging from 1675 to 2745 m. Within this distribution the species is restricted to two vegetation types as defined by Acocks (1988). Along the high Drakensberg escarpment it occurs in *Themeda-Festuca* Alpine Veld that receives an annual precipitation of 600–1900 mm. *Polystichum dracomontanum* occurs in grasslands and scrub forests associated with this vegetation type. To the north, along the escarpment between the Free State and KwaZulu-Natal, dominated by the Clarens Sandstone formation, the species occurs in sheltered forests of the Highland Sourveld type. Precipitation in this region measures between 750 and 1500 mm. The habitat includes streambanks, boulder bases, screes and scrub, and rarely also forests. *Polystichum dracomontanum* prefers moist cool slopes in shaded gullies and kloofs where it often forms large stands. At certain sites the species is subjected to regular veld fires, but this appears to have no adverse effect on plants.

16. **Polystichum incongruum** J.P. Roux in *Bot. J. Linn. Soc.* **125**: 36 (1997). Type: South Africa, 3320 (Montagu): Swellendam, Marloth Nature Reserve, Koloniesbos, in scree on dry E.-facing slope (CD), *Roux* 2377 (NBG!-holotype).

Fig. 16.

Plants terrestrial. *Rhizome* decumbent, stout, to 16 mm in diameter, sparsely branched, set with roots, crowded stipe bases, and castaneous to ferrugineous, chartaceous paleae. *Fronds* crowded, to 8 per plant, suberect to arching, to 1.8 m long: *stipe* proximally castaneous, stramineous for most of its length, adaxially sulcate, to 930 mm long × 7 mm in diameter, moderately to densely paleated; paleae at stipe base of two types, the larger broadly attached, ferrugineous to stramineous, membranous, narrowly to broadly ovate-acuminate, rarely with unicellular clavate cells on the paleae surface, cordate to cordate-imbricate, the margins with short close-set outgrowths, the apex often flagelliform, terminating in an acicular cell or an oblong thin-walled cell, to 20 × 6 mm, the smaller sessile to short-stalked, stramineous, membranous, narrowly ovate-acuminate to narrowly triangular, truncate to cordate-imbricate, with short and/or long, straight or curved, somewhat lacerate outgrowths proximally, the apex flagelliform, entire and twisted, mostly terminating in an acicular cell but often also in a thin-walled cell: *lamina* 2-pinnate to 3-pinnate, with up to 27 free pinna pairs, ovate to broadly ovate, to 870 mm long, the pinnae more widely spaced proximally, the distal pinnae often imbricate, the proximal pinnae not to strongly reduced, not or slightly deflexed: *rachis* stramineous, adaxially sulcate, moderately to densely paleated; paleae sessile to short-stalked, ferrugineous to stramineous, membranous, narrowly ovate-acuminate to narrowly triangular-acuminate, truncate, cordate or cordate-imbricate, the margins proximally with short and/or long, curved, often branched outgrowths reduced in size and number towards the apex, the apex often flagelliform, twisted, terminating in an acicular cell or an oblong thin-walled cell, to 12 × 3 mm: *pinnae* 1-pinnate to 2-pinnate, with up to 21 free pinnule pairs, narrowly oblong-attenuate to narrowly ovate-attenuate, themiddle pinnae to 265 mm long, to 95 mm wide: *pinna-rachis* stramineous, adaxially sulcate, moderately to densely paleated; paleae sessile to short-stalked, ferrugineous to stramineous, membranous, narrowly ovate-acuminate, narrowly triangular-acuminate to subulate, cordate to cordate-imbricate, the proximal margins with short and/or long, often branched outgrowths reduced in size and number towards the apex, the apex often flagelliform, twisted, largely terminating in an acicular cell but often also in an oblong thin-walled cell, to 7 × 2 mm: *pinnules* opposite to alternate, closely to widely spaced, often slightly imbricate, firmly herbaceous to coriaceous, dark green adaxially, slightly paler abaxially, inaequilateral, ovate to narrowly trullate, often somewhat falcate, basiscopically cuneate, acroscopically cuneate to truncate and auriculate, the larger pinnules commonly deeply incised to form free or nearly free, narrowly ovate, narrowly elliptic to narrowly obovate ultimate segments, the margins serrate to doubly serrate, rarely aristate, the proximal acroscopic pinnule to 60 mm long, to 13 mm wide, often overlapping the pinna-rachis above; adaxially sparsely set with stramineous, membranous, twisted paleae chiefly along the costa, these filiform, narrowly linear to narrowly linear-hastate, simple or with few short marginal outgrowths proximally, the apex usually terminating in an acicular cell but often also in an oblong thin-walled cell, to 4.5 mm long, abaxially moderately paleated; paleae stramineous, membranous, subulate to narrowly triangular, twisted, short-stalked, truncate to cordate, proximally with short and/or long, often branched, somewhat lacerate marginal outgrowths, the apex usually terminating in an acicular cell, up to 3.5 mm long. *Venation* adaxially

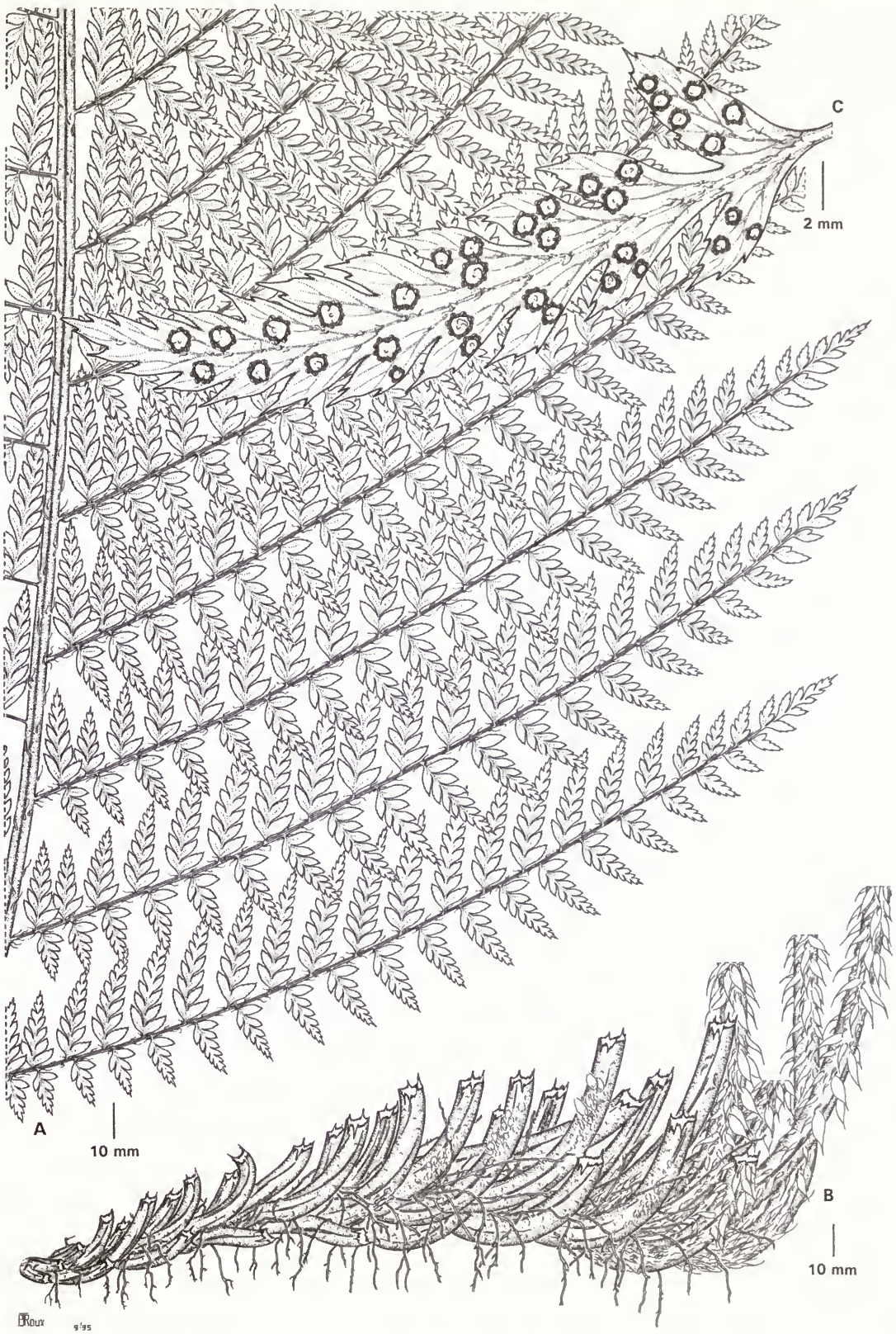

Fig. 16 *Polystichum incongruum*. A, middle pinnae of lamina; B, rhizome; C, abaxial surface of fertile pinnule. All drawn from *Roux* 2377 (NBG).

obscure, raised abaxially. *Sori* circular, up to 1.5 mm in diameter, terminal or near terminal on abbreviated vein branches, essentially uniseriate, discrete: *sporangium* with 11–(13)–21 indurated annulus cells; stalk glandular or eglandular: *indusium* stramineous or stramineous and black-centred, persistent, circular, simple or with central processes, the margins entire, minutely undulate to erose, often bearing clavate unicellular glands, the maximum radius 0.22–(0.46)–0.82 mm. *Spores* stramineous, the perispore folded to form narrow and broad reticulate ridges, the ridges crested, the crests and areas between minutely echinulate, porate, the exospore 30–(43.84)–72 × 22–(33.22)–52 µm. *Chromosome number* 2n=164, n=82.

MATERIAL EXAMINED

SOUTH AFRICA. 3226 (Fort Beaufort): summit of Katberg Pass (BC), *Roux* 2426 (NBG); Katberg forests, 3000 ft, *Adams* 113, 118, 134, 147 (NU); Hogsback, Zingcuka Forest (DB), *Roux* 2409, 2412 (NBG); Hogsback, Elandsberg, SE slope above scree, 4900 ft, *Furness & Phillipson* 49 (PRE); Hogsback, Auckland Forest Station, *Roux* 2418, 2419, 2420, 2421 (NBG); Hogsback Forest Reserve, 750 m, *Dahlstrand* 2926 (NBG); Hogsback Forest Reserve 'Fern Walk', 800 m, *Dahlstrand* 1550 (PRE); Auckland Forest, Hogsback, 750 m, *Dahlstrand* 2819 (NBG); Hogsback, 3900 ft, *Griffen* 1852 (PRE); Hogsback, *Buckner* s.n. (NU); Hogsback, *Dahlstrand* 1853 (NU); Hogsback, 4000 ft, *Hoal* 36 (NU); Middle Drift District, Hogsback, 3900 ft, *Schelpe* 6556 (B, PRE). **3227 (Stutterheim)**: Keiskamma Hoek, Gxulu Mountain, 5500 ft (BA), *Story* 3507 (PRE); Keiskammahoek, Gxulu Kop, 4500 ft (CA), *Wells* 3343 (PRE); Perie Forest (CB), *Sim* s.n. (PRE); Stutterheim, Evelyn Valley, *Taylor* 4203 (NBG); Mount Kemp, 5000 ft, *Sim* s.n. (PRE); Perie Forest, 4000 ft, *Sim* s.n. (PRE); Amabele (DA), *Hardcastle* 293 (NBG, PRE); ±1 km past Amabele station on road to Stutterheim, *Roux* 2678 (NBG). **3320 (Montagu)**: Swellendam, Koloniesbos (CD), *Roux* 2373, 2377, 2589, 2590, 2591 (NBG); Swellendam, Duiwelsbos, along trail leading to Die Plaat, *Roux* 2592, 2593, 2595 (NBG); Swellendam, Wamakersbos, *Roux* 2594 (NBG); Heidelberg, Grootvadersbos, Safraandraai (DD), *Roux* 2598 (NBG); Grootvadersbosch West, 1200 ft, *Kruger* 1322 (NBG, PRE); Grootvadersbos, *Plantkunde Dept. Univ. van Stellenbosch* s.n. (NBG); Swellendam, Strawberry Hill, *Esterhuysen* 10371 (BOL). **3322 (Oudtshoorn)**: Mossel Bay, Robinson Pass, Ruitersbos, Boesmansrivier, 1200 m (CC), *Roux* 2603, 2604, 2605, 2606 (NBG); Mossel Bay, Ruitersbos Forest Station, *Roux* 2381 (NBG); Groot Brakrivier, Jonkersberg Forest Station, Langbos, 380 m, *Roux* 2607, 2608, 2609, 2610, 2611, 2612 (NBG); Robinson Pass, 1700 ft, *Schelpe* 4989 (BOL); George, ±1 km from turnoff to Witklippen Forest on old George-Knysna road (CD), *Roux* 2391, 2392 (NBG); George, lower circular drive, 275 m, *Cameron* 90 (PIC-SERM); George, *Paterson* 1239 (BOL); George, *Schlechter* 525 (PRE); George District, 200 m, *Humbert* 9834 (PRE); George, Montagu Pass, forest at summit of pass, *Roux* 2613 (NBG); Montagu Pass, *Rehmann* 118 (B); Woodville Forest, 440 m (DA), *Roux* 2622, 2623, 2624, 2625 (NBG); George, on road to Bergplaas Forest Station, ±1 km past turnoff to Woodville hiking trail (DC), *Roux* 2395, 2396, 2397, 2398 (NBG); George, Saasveld Forest Station, Groenkop Research Area, *Roux* 2434 (NBG); George, Groenkop, Swartrivier, 300 m, *Van Daalen* 167 (BOL); old road between George and Knysna, above Touws River, Knysna side, 260 m, *Roux* 2620, 2621 (NBG); George, Groenkop Forest, *Geldenhuys* 394 (BOL); Wilderness, *Levyns* s.n. (BOL); George, Wilderness, *Mogg* 11656 (PRE); George, *Schlechter* s.n. TM525 (PRE); in silvis pr. George, 300 m, *Schlechter* 2441 (B); George, Wilderness, *Jacobsen* 2292 (PRE); George, Saasveld, forest above the reservoir, *Roux* 2384, 2385 (NBG); George, ±1.2 km from Saasveld turnoff on road to George, *Roux* 2437, 2438, 2439, 2440, 2441, 2614, 2615, 2616, 2617, 2618 (NBG); old road between George and Knysna, above Touwsriver, George side, 210 m, *Roux* 2619 (NBG); Goudveld Forest Reserve, Jubilee Creek forest walk, 340 m (DD), *Roux* 2627, 2629 (NBG); Farleigh Forest Station, forest above Platbos hut, *Roux* 2401 (NBG). **3323 (Willowmore)**: Concordia Forest Station, near Witklipdraai (CC), *Roux* 2637 (NBG); Knysna, Kom-se-Pad, Gouna Forest, Grootdraai picnic site, *Roux* 2638 (NBG); Knysna, Kom-se-Pad, 2.2 km from T-junction to Diepwalle, *Roux* 2405 (NBG); Knysna, Kleinbos, Buffelsnek, *Schelpe* 4312 (BOL); Knysna, Paardekop, *Steyn* 720 (NBG); Knysna, Deepwalls, *Schönau* 318 (BOL); Knysna, Gouna, *Schelpe* s.n. (BOL); Keurbooms River Forest Reserve, 200 m (CD), *Dahlstrand* 1355 (NBG); Bloukrans Pass, Varkrivier (DC), *Roux* 2649, 2650, 2651 (NBG); Bloukrans Forest Station, Platbos, along hiking trail, 260 m, *Roux* 2645 (NBG); Bloukrans Pass, 300 ft, *Schelpe* 4342 (BOL); Bloukrans Pass, *Acocks* 21298 (PRE); Tsitsikama Forest Reserve (DD), *Roux* 2647 (NBG); Storms River Forest Reserve, 100 m, *Dahlstrand* 1693 (PRE); Stormsriver, 250 ft, *Schlechter* 5963 (PRE); Stormsriver Gorge, 400 ft, *Jacobsen* 2331 (PRE); in umbr. pr. Storms River, 80 m, *Schlechter* 5963 (B); Tsitsikama Forest Reserve, 260 m, *Roux* 2648 (NBG). **3423 (Knysna)**: Knysna, Kaffirkop Forest, 420 m (AA), *Roux* 2640, 2641, 2642 (NBG), near Knynsna, *Mitchell* s.n. (M, PRE); Knysna, Kaffirkop Forest, *Roux* 1994, 1995, 1996 (NBG); Knysna, *Marloth* 5710, 5711 (PRE); Knysna, *Rex* s.n. (PRE); Knysna, *Mitchell* s.n. (BOL); Tzitzikamma forest, 1 mile E. of Storms River village, 850 ft (BB), *Schelpe* 4372 (BOL); Storms River mouth, *Maguire* 507 (NBG). **3424 (Humansdorp)**: Hofman's Bosch (BB), *Britten* s.n. (PRE).

WITHOUT PRECISE LOCALITY: Puspasvlei, Voormansbosch, Duivelsbosch and Keurboom, 1000–4000 m, *Zeyher* 4610 (PRE); George to Wilderness, *Moss* 6280 (PRE); Zuurberg, *Rogers* s.n. (PRE); loco incerto, *Dahlstrand* 1303 (NU); loco incerto, *Zeyher* s.n. B-97089 (B); loco incerto, *Burchell* 5200 (B); Kaffrarian forests, *sine coll.* 96893 (B); loco incerto, *sine coll.* B-96855 (B); Pr. b. sp, *Zeyher* 4610 (B); Cap. b. Sp., *Krebs* 360 (B); Prom. bon. spei, *Düring* s.n. (B); Cap. b. sp., *Drège* s.n. (B); Pr. b. sp., *Ecklon & Zeyher* 63 (B); Cap Colonie, *Breutel* s.n. (B); loco incerto, Herb. Lipzig, A & B only B-97050 (B); loco incerto, Herb. Lipzig 97051 (B); loco incerto, *Braun* s.n. (B); loco incerto, *Gueinzius* s.n. B-97069 (B); between Plettenberg Bay and Humansdorp, *Rodin* 1191 (BOL, PRE, S); loco incerto, *d'Urban* s.n. (B); loco incerto, Hort. bot. Berol. B-97049 (B); loco incerto, Hort. bot. Berol. B-97047 (B); Pr. b. spei, *sine coll.* B-97048 (B).

DIAGNOSTIC FEATURES AND RELATIONSHIPS. Differentiation in the field between this species and *Polystichum pungens* is not always easy because of their sympatric distribution, the variation within and among populations, and the absence of stable macromorphological characters. However, *P. incongruum* can be separated from *P. pungens* by its thicker, more stout rhizome. The pinnules in the former species are narrower, more slender and acuminate (often also slightly falcate), compared to the somewhat ovate to ovate-oblong, almost obtuse pinnules of *P. pungens*. A further character separating *P. incongruum* from *P. pungens* is the frequent occurrence of clavate unicellular glands along the sporangium stalk in the former species. Clavate unicellular glands occurring along the indusium margin have also been observed in some populations in the southern Cape, a feature never occurring in *P. pungens*. The former species is furthermore a sexual tetraploid (2n=164), whereas *P. pungens* is a sexual octoploid (2n=328).

VARIATION. Variation in lamina morphology is perhaps the most apparent, hence the specific epithet (*incongruens* = inconsistent). Lamina division may vary between 2-pinnate to 3-pinnate, the pinnae being narrowly oblong-attenuate and widely spaced to narrowly ovate-attenuate and imbricate, with extreme variations often occurring within populations. Proximal pinnae may be reduced or not with the length ratio between these and the middle pinnae ranging between 1:1 and 1:0.42. The most proximal pinna pair is often deflexed. Pinnules also show a large degree of variation in size and incision as illustrated by Roux (1997*b*). Proximal acroscopic pinnules also show a large degree of variation in length. In some plants these pinnules are only slightly longer than the next pinnule, but in others the pinnules may extend beyond the pinna-rachis of the pinna above. These variations do not appear to be environmentally induced, but the variation in frond size and lamina texture is clearly influenced by the environment. Plants occurring in exposed habitats in the Amatola Mountains have short erect fronds, a coriaceous lamina, and sprout from a stout rhizome, whereas plants growing in shaded habitats have long and slender arching fronds with a herbaceous lamina, and the rhizome is slender and branches freely. Palea

morphology shows minor variations between plants from the southern and eastern part of the distribution. In the southern part of the distribution the apices of the generally long marginal outgrowths of the paleae tend to split leaving a somewhat lacerated appearance, whereas in the eastern part of the distribution the outgrowths are short and tend not to split at the apices. Indusia vary in size, shape, the absence or presence of central processes, and in the occurrence of clavate unicellular glands along the margin. When glandular cells are present along the indusium margin of a specific collection not all indusia will bear them. Glandular cells along the sporangium stalk may be present or absent. Since these variations occur randomly they are not considered to be environmentally induced.

DISTRIBUTION AND ECOLOGY. *Polystichum incongruum* is confined to the Western and Eastern Cape Provinces of South Africa. The species has a somewhat disjunct distribution, with a southern centre ranging from Swellendam to Hofmans Bosch and an eastern region centred in the Amatola Mountains. In the Swellendam region the species occurs in forests of the 'Ngongoni veld type (Acocks, 1988). These forests are small, isolated, and confined to deep sheltered ravines and steep slopes below the south-facing cliffs. In the southern Cape the species is confined to the Knysna forest type, which is more extensive. This region receives a well-distributed rainfall that ranges between 460–1250 mm per annum. Soil in this region is sandy and is largely derived from weathered Table Mountain Sandstone. In the eastern part of its distribution the species occurs at elevations ranging between 600 and 1350 m where forests of the Dohne Sourveld type are predominant. In this region, however, the species is not confined to forested habitats but also occurs above the tree-line. The region receives an annual rainfall of 600–1000 mm with regular snowfalls during winter and the soil is predominantly of doleritic derivation.

In the southern part of its distribution the species is confined to forests where it forms small or large clonal stands and is especially common in light shade along streambanks, road cuttings and forest clearings. It may occur in dryish or very wet conditions. In the eastern part of its distribution the species occurs in more varied habitats ranging from natural forests to pine plantations but also occurs above the tree line forming large stands along streams, on screes and at boulder and cliff bases. Plants in the latter habitats are exposed and generally stunted with short erect fronds. In this region the plants are frequently subjected to veld fires but this appears not to adversely affect them.

17. **Polystichum pungens** (Kaulf.) C. Presl, *Tent. pterid.*: 83 (1836); Schelpe & Anthony, *Fl. Sthn. Afr., Pterid.*: 254 (1986), pro parte; Burrows, *Sthn. Afr. ferns and fern allies*: 312 (1990), pro parte. Type as for *Aspidium pungens* Kaulf.

Fig. 17.

Aspidium pungens Kaulf., *Enum. fil.*: 242 (1824). Type: Habitat in Promentorio b. spei, *Chamisso* s.n. (LE-holotype; BOL!-photograph).

Dryopteris pungens (Kaulf.) Kuntze, *Rev. gen. pl.* **2**: 813 (1891).

Plants terrestrial or epilithic. *Rhizome* decumbent, sparsely branched, to 370 mm long, to 20 mm in diameter, set with roots and closely to widely spaced persistent stipe bases, the older parts nude, the apical part densely paleated; paleae broadly attached, castaneous to ferrugineous, chartaceous, narrowly lanceolate to narrowly ovate, truncate to cordate, the margins subentire to erose, the apex flagelliform, generally terminating in a small thin-walled cell, to 17 × 3 mm. *Fronds* 5–6 per plant, suberect to arching, to 1.4 m long: *stipe* proximally castaneous, stramineous distally, adaxially sulcate, to 685 mm long × 7 mm in diameter, sparsely to densely set with conspicuous larger and smaller paleae; larger paleae more frequent proximally, widely spaced and smaller distally, proximally castaneous, broadly attached, distally ferrugineous, chartaceous, narrowly to broadly ovate, often oblique, cordate to cordate-imbricate, the margins minutely erose to short-fimbriate, the apex flagelliform, terminating in a long acicular cell or a small oblong thin-walled cell, to 21 × 6 mm; smaller paleae short-stalked, ferrugineous to stramineous, chartaceous to membranous, narrowly triangular, narrowly lanceolate to narrowly ovate, cordate to cordate-imbricate, the margins proximally erose or with short and/or long, straight or curved outgrowths, the apex entire, flagelliform, terminating in a long acicular cell or a small oblong thin-walled cell: *lamina* 2-pinnate to 2-pinnate-pinnatifid, with up to 21 free pinna pairs, firmly herbaceous, adaxially dark green, abaxially slightly paler, ovate to broadly ovate, to 704 mm long, the pinnae often slightly imbricate distally, more widely spaced proximally, the most proximal pinna pair slightly reduced, often somewhat deflexed: *rachis* stramineous to greenish, adaxially sulcate, sparsely to densely paleated; paleae short-stalked, ferrugineous to stramineous, membranous, ovate, narrowly ovate to narrowly triangular, sessile or short-stalked, cordate to cordate-imbricate, the proximal margins erose to sparsely fimbriate or with short and/or long, curved or angular, often branched outgrowths that reduce in size and number towards the apex, the apex flagelliform, terminating in a long acicular cell or a small thin-walled cell: *pinnae* 1-pinnate to 1-pinnate-pinnatifid, with up to 24 free pinnule pairs, narrowly ovate-attenuate to narrowly oblong-attenuate, to 272 × 48 mm; *pinna-rachis* stramineous, adaxially sulcate, moderately to densely paleate; paleae ferrugineous to stramineous, membranous, narrowly triangular, short-stalked, cordate-imbricate, the proximal margins with short and/or long, often branched outgrowths reduced in size and number towards the apex, the apex flagelliform, twisted, terminating in an acicular cell or a small thin-walled cell, to 4.5 mm long, each pinna often subtended by one or more large, often bullate, broadly ovate, cordate, minutely erose to fimbriate paleae: *pinnules* opposite to alternate, widely spaced to slightly imbricate, the proximal acroscopic pinnule the largest, often significantly longer than the next, especially towards the middle of the lamina, each subtended by one or more large, often bullate, broadly ovate paleae, similar to but smaller than those on the rachis, inaequilateral, ovate, ovate-oblong to ovate-rhomboid or trullate, often somewhat falcate, basiscopically cuneate, acroscopically cuneate to truncate and auriculate, the larger pinnules commonly deeply incised near to the costa forming a nearly free auricle acroscopically, the margins serrate to lobate-serrate, sharp-tipped, rarely aristate, the costa proximally adaxially sulcate, most proximal acroscopic pinnule to 50 mm long, to 19 mm wide, often reaching beyond pinna-rachis above; adaxially sparsely set with paleae chiefly along costa, filiform to taeniform, the margins entire or proximally with a few short curved or long angular outgrowths, the apex terminating in a long acicular cell or a small thin-walled cell, to 6 mm long; abaxially sparsely to moderately paleate, the paleae stramineous, membranous, short-stalked, subulate, narrowly triangular to narrowly ovate, cordate to cordate-imbricate, the margins proximally with short and/or long, angular outgrowths, the apex entire, filiform, terminating in a long acicular cell or a small thin-walled cell, to 3.7 mm long. *Venation* adaxially obscure, raised abaxially. *Sori* circular, *c.* 1 mm in diameter, terminal or near terminal on abbreviated vein branches, essentially uniseriate, discrete at maturity: *sporangium* with 10–(12.8)–19 indurated annulus cells; stalk eglandular: *indusium* peltate, stramineous, castaneous or black, nitid, amorphous to circular, entire to repand, the maximum radius 0.26–(0.5)–0.8 mm in diameter,

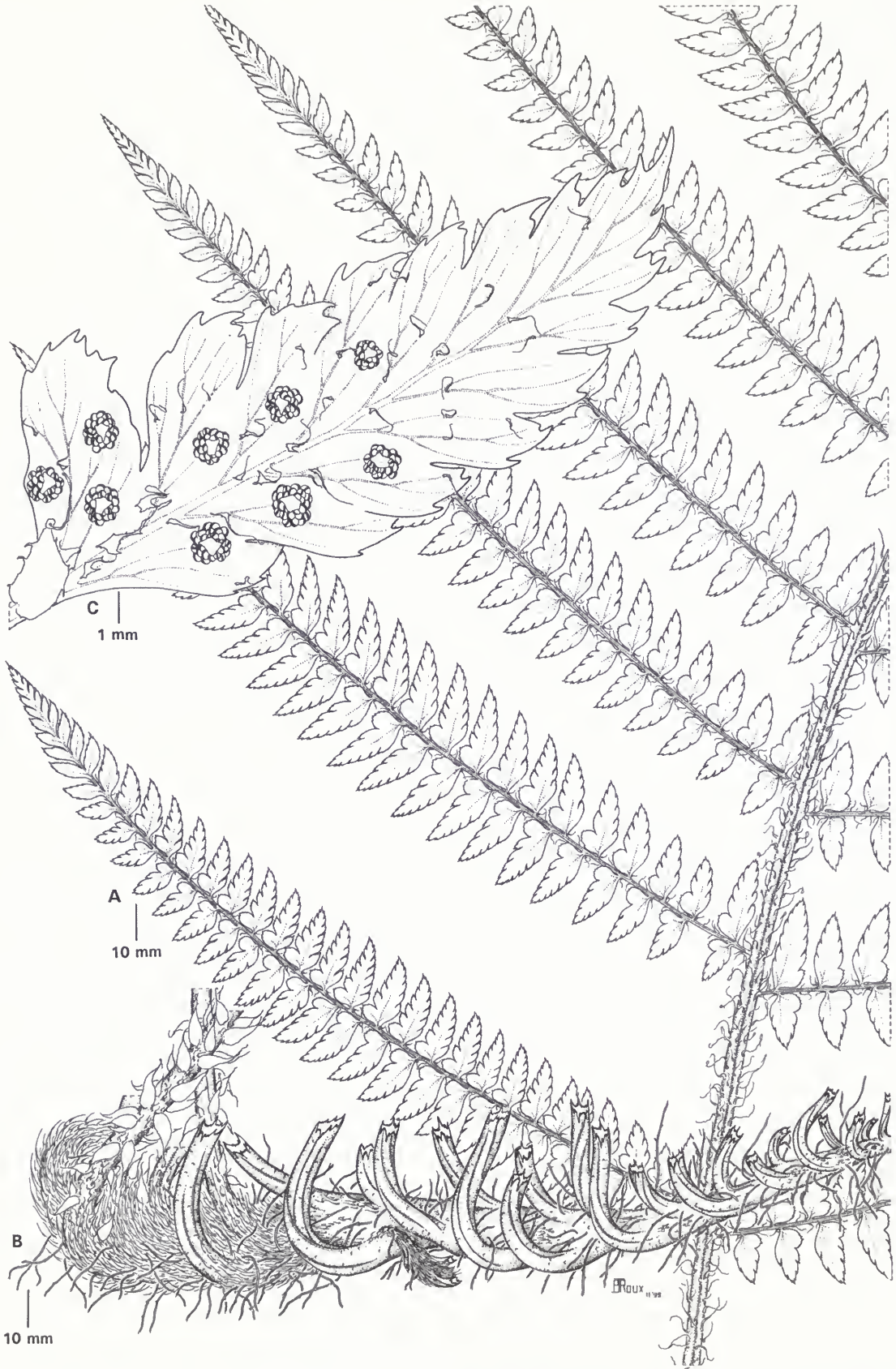

Fig. 17 *Polystichum pungens.* A, proximal part of lamina; B, rhizome; C, abaxial surface of fertile pinnule. All drawn from *Roux* 2367 (NBG).

persistent, brown. *Spores* pale brown, 64 per sporangium, the perispore folded to form inflated reticulate ridges, the ridges crested, the ridges and areas between sparsely to densely echinulate, variously porate, the exospore 30–(49.31)–62 × 28–(38.08)–56 µm. *Chromosome number* 2n=328.

MATERIAL EXAMINED

SOUTH AFRICA. 2330 (Tzaneen): Woodbush (CC), *Wager* s.n. CH7461 (PRE); De Hoek, Woodbush, *Schweickerdt* s.n. TM1852C (PRE). **2430 (Pilgrim's Rest)**: Pilgrim's Rest, Mount Sheba Nature Reserve, Waterfall trail (DC), *Roux* 2554 (NBG). **2730 (Vryheid)**: Hlobane, Mto!a forest (DB), *Johnstone* 295 (NU). **2828 (Bethlehem)**: Royal Natal National Park, Gudu forest, Gudu waterfall (DB), *Roux* 2512 (NBG); Royal Natal National Park, Gudu forest, *Schelpe* 1454 (NU). **2829 (Harrismith)**: Farm Whitestones (CA), *Roux* 1901 (NBG, PRE); Bezuidenhouts Pass, farm Whitestones, *Roux* 1684 (NBG, PRE); Oliviershoek Pass, forests S. of Seheletwane, *Roux* 2519 (NBG); Cathedral Peak area, Indumeni forest, 5100 ft (CC), *Schelpe* 781 (NU). **2831 (Nkandla)**: Eshowe (CD), *Laura* s.n. CH6421 (PRE). **2929 (Underberg)**: Giants Castle Nature Reserve, forest above Hillside camping site (AB), *Roux* 2500, 2502, 2505 (NBG); Lions River District, Lions Bush, 5000 ft (BD), *Moll* 832 (PRE). **2930 (Pietermaritzburg)**: Buccleuch (AD), *Sim* s.n. CH3641 (PRE); Hilton Road (CB), *Wager* s.n. B-only (NU); Hilton District, Cedara Dam, 3200 ft, *Churcher* s.n. (NU); Zwaartkop, *Sim* s.n. PRE-11026 (PRE); *Sim* s.n. CH387 (PRE); *Sim* s.n. TM1239C (PRE). **2931 (Stanger)**: prope Mapumulo (AA), *Abraham* s.n. (B). **3029 (Kokstad)**: Insizwa forest (CC), *Strey* 10749 (PRE). **3030 (Port Shepstone)**: Paddock, Burntwood (CC), *Strey* 5994 (PRE). **3128 (Umtata)**: Tsolo District, Ngadu, 3200 ft (BC), *Von Breitenbach* 1330 (PRE). **3129 (Port St Johns)**: Port St Johns (DA), *Wager* s.n. CH2996 (PRE). **3225 (Somerset East)**: Boschberg (DA), *MacOwen* s.n. (P); forest kloofs of the Boschberg mountain, *sine coll.* s.n. (P); in sylvis ad ped. Mont. Boschberg, 3000 ft (DA), *MacOwen* s.n. (B). **3226 (Fort Beaufort)**: Katberg forests (BC), *Adams* 168, 175 (NU); Hogsback, Auckland forest (DB), *Roux* 510 (NBG); Hogsback forest, 4250 ft, *Schirach* 280 (NBG); Hogsback, *Stirton* 6267 (PRE). **3227 (Stutterheim)**: Fort Cunninghame, 3300 ft (AD), *Galpin* 2446 (PRE); Isidenge forest (CA), *Roux* 1981 (NBG); Keiskamma Hoek, 2000 ft, *Ely* s.n. (PRE); Cathcart, Fort Cunningham forest Reserve (CB), *Roux* 2428, 2429, 2432 (NBG); Frankfort, *Sim* s.n. (PRE); Pirie, *Sim* s.n. (PRE); Dohne Hill, *Sim* s.n. (PRE); Komgha (DB), *Flanagan* s.n. (PRE). **3318 (Cape Town)**: Nursery Gorge (CD), *Schelpe* s.n. BOL-35933 (BOL); head of Nursery Gorge, *Esterhuysen* 25851 (BOL); top of Nursery Gorge, *Esterhuysen* 15355 (BOL); Devils Peak, Dark Gorge, *Esterhuysen* 26564 (BOL, NBG); Table Mountain, Hiddingh Ravine, *Esterhuysen* 25862 (BOL); Kirstenbosch, *sine coll.* BOL-55808 (BOL); Devils Peak, waterfall, *Wolley-Dod* 915 (BOL); Table Mountain, Skeleton Gorge, *Schelpe* s.n. (BOL); SE slopes of Devils Peak, *Pillans* 2694 (BOL); Skeleton Gorge, *Esterhuysen* 26674 (BOL); Skeleton Gorge, *Roux* 97 (BOL); mountain woods at back of Newlands, *sine coll.* s.n. (P); Newlands Ravine above contour path, *Roux* 2370, 2371 (NBG); Lubberts Gift, *Roux* 2372 (NBG); Kirstenbosch, contour path, *Compton* 14629 (NBG); Window Gorge, *Roux* 36 (NBG); Dark Gorge, *Roux* 2367, 2368*a*, 2369 (NBG); Window Gorge, *Wasserfall* 84, 156 (NBG); Newlands, Paradise, *Rawson* s.n. (SAM). **3320 (Montagu)**: Heidelberg, Grootvadersbosch (DD), *Roux* 2596 (NBG); Grootvadersbosch, Safraandraai, *Roux* 2597, 2599 (NBG); Grootvadersbosch, Stinkhout hiking trail, *Roux* 2378, 2379, 2380 (NBG); Grootvadersbosch, *Taylor* 1228 (BOL); Grootvadersbosch, near end of road running past redwoods, *Roux* 2600 (NBG). **3322 (Oudtshoorn)**: George, Wildernes (DC), *Compton* 14305 (NBG); Goudveld Forest Station, Krisjan se Nek picnic site (DD), *Roux* 2626 (NBG). **3325 (Port Elizabeth)**: Enon (BC), *sine coll.* B-97063 (B). **3326 (Grahamstown)**: in sylvis prope Grahamstown (BC), *MacOwan* s.n. (P); kloofs near Grahamstown, *Holland* s.n. (NBG). **3418 (Simonstown)**: Diepgat, kloof below SW Triplets (BB), *Esterhuysen* 27060 (BOL); ravines of the Helderberg, *Parker* 4311 (BOL). **3419 (Caledon)**: Riviersonderend, Oubos (BB), *Roux* 2586 (NBG). **3423 (Knysna)**: Knysna (AA), *Marloth* 1901 (L).

SWAZILAND. 2631 (Mbabane): Millers Falls, 4500 ft (AC), *Compton* 25967 (NBG); 5 km NW of Mbabane, 1200 m, *Kemp* 896 (PRE).

WITHOUT EXACT LOCALITY: loco incerto, *sine coll.* BOL-55877 (BOL); Albany District, *Cooper* 1415 (P); Africa austral, *Drège* s.n. (P); Cap. b. spei, *Bojer* s.n. (P); Cap. b. spei, Herb Musei Palat. Vindob. 126 (P); in umbrosis montium Hottentots Hollandiae, *Zeyher* s.n. (SAM); Drakensberg, *Bottomley* s.n. CH5018 (PRE); Fort Beaufort District, *Myburg* s.n. (NBG); Bedford District, *Van Rensburg* s.n. (NBG); Katberg, *Young* s.n. (PRE); Natal, Pondoland and Zululand midlands, *Watt & Brandwyk* 336 (PRE); district of Albany, *Cooper* 1415 (PRE); loco incerto, *Flanagan* s.n. (PRE); Kaffirland, St. Augustine, *Baur* 215, B-only (B); Afr. austr., *sine coll.* s.n. (B); Prom. b. spei, *Krebs* 360 (B), Natalia, *Buchanan* 85 (B); Natalia, in sylva ad fr. Tugela, *Gueinzius* s.n. (B).

Controversy as to the correct name for this taxon has existed for a long time. Sim (1892) initially labelled this species as *Aspidium aculeatum* var. *pungens*, but by 1915 he realized that two entities could be recognized, a forest dwelling species that he referred to *Polystichum aculeatum* and a montane form that he referred to *P. pungens*. Becherer (1937), however, proposed the name *P. lucidum* (Burm.f.) Becherer (= *Asplenium lucidum* Burm.f.) for the forest growing species, a name that became well entrenched (Schelpe, 1969; Roux, 1979; Jacobsen, 1983). Following a reinterpretation of the types, Anthony & Schelpe (1985) concluded that *Asplenium lucidum* Burm.f. is synonymous with *Asplenium adiantum-nigrum* L. This largely follows the view of C.V. Morton who distributed photographs of what he believed to be the type of the species. A review of these anomalous typifications has been provided by Roux (1994). Since it was concluded that *A. lucidum* is synonymous with *A. adiantum-nigrum*, a new name was required for the forest species. The next available name for the species is *P. pungens* (Kaulf.) C. Presl (= *Aspidium pungens* Kaulf.).

DIAGNOSTIC FEATURES AND RELATIONSHIPS. *Polystichum pungens* forms part of a species group characterized by decumbent rhizomes and paleae that usually terminate in a long flagelliform apex. It can, however, be separated from other taxa in the group by not having glandular cells on the sporangium stalk and by the longer, more slender rhizome. Furthermore, *P. pungens* has a somatic chromosome number of 2n=328, versus 2n=164 in *P. incongruum* with which it may be confused and to which it evidently is related.

VARIATION. Variation in pinnule size and shape may be influenced by numerous environmental factors. Smaller pinnules may be ovate in outline and shallowly lobate-dentate. As the pinnules increase in size, they become more deeply lobate in the proximal part of the pinnule, often extending to the costa, resulting in the proximal acroscopic segment being short-stalked. The proximal acroscopic pinnule is generally longer than the following pinnule. The length ratio of the proximal and the following pinnule taken from the central part of the lamina ranges between 1:0.91 [*Compton* 14629 (NBG)] and 1:0.56 [*Roux* 2368*a* (NBG)].

Paleae vary mostly in shape and in the degree to which the margin is sculptured. Although most paleae terminate in a long filiform apical cell, some do terminate in a short, thin-walled cell. In one collection [*Esterhuysen* 26564 (BOL, NBG)] unicellular glandular cells also occur along the palea margin as well as on the surface of the larger rhizome paleae.

Indusium size and outline vary considerably within the species. Although indusia are generally peltate, often some are reniform or have the flange not fully 360° developed. Both conditions are frequent within a single plant. Although the general outline of the indusium may be considered circular, it is often irregular with the margins varying from subentire to repand. Indusia appear to increase in size from the western part of the distributional range to the east. The plant with the smallest mean indusium radius was recorded from Table Mountain [*Compton* 14629 (NBG), x=0.3 mm; n=6] and the plant with the largest mean radial length is from the George region [*Roux* 2626 (NBG), x=0.71 mm; n=6]. The maximum radius of the indusia varies between 0.26 and 0.78 mm. Plants as far east as

Port Elizabeth usually have stramineous indusia, whereas plants ranging from the Boschberg farther north have dark, almost black indusia, and are uniform in outline.

DISTRIBUTION AND ECOLOGY. *Polystichum pungens* is restricted to South Africa and Swaziland. In this region the species occurs from Table Mountain on the Cape Peninsula to the Hottentots Holland Mountains, along the Riviersonderend, Langeberg, Outeniqua and Great Winterhoek Mountains to Port Elizabeth and Grahamstown. Inland it occurs from the Boschberg at Somerset East to the Amatola Mountains and along the Drakensberg foothills to the Wolkberg in the Northern Province.

In the eastern part of its distribution *P. pungens* is restricted to isolated climax forest patches largely restricted to the southern mountain aspects and sheltered ravines. This region, and the more extensive Knysna forest complex, is subject to a high, well-distributed rainfall and acidic sandy soils. At Grahamstown and on the Boschberg the species occurs in temperate scrub forest subject to more seasonal precipitation. In the Amatolas the species occurs in forests of the Dohne Sourveld type that lie between 600–1350 m above sea level. From here the distribution extends to the eastern slopes and foothills of the Drakensberg. Forests in this region are of the Highland Sourveld type, which is largely confined to the deep gorges and protected mountain slopes occurring at elevations ranging from 1350–2150 m. To the north the species occurs in forests of the Northeastern Mountain Sourveld. In the Eastern Cape and southern KwaZulu-Natal it has been reported from forests of the Pondoland Coastal Plateau Sourveld that are found at an elevation of 300–450 m. These forests are largely confined to the escarpment, gorges and valleys below krantzes. In the KwaZulu-Natal midlands it is confined to forests of the Mist Belt 'Ngongoni Veld, whereas in northern KwaZulu-Natal it occurs in 'Ngongoni Veld.

Polystichum pungens is a terrestrial or epilithic species occurring as isolated individuals or often also as large clones on dryish or moist slopes in partially to deeply shaded conditions. In Newlands Ravine on Table Mountain, however, the species forms extensive stands on exposed east-facing slopes.

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—— 1996*b*. A taxonomic study on the fern genus *Polystichum* Roth sect. *Metapolystichum* Tagawa from China (III). *Acta Phytotaxonomica Sinica* **34**: 194–203.

SYSTEMATIC INDEX

Accepted names are in roman and synonyms in *italics*.

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Recent records of pteridophytes for Belize, Central America

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CONTENTS

SYNOPSIS. Belize has one of the richest pteridophyte floras in the world, expressed on an area basis. Analysis of recent collections and the widely scattered literature for the country reveals that the number of species has risen by approximately 20% since the publication of the major regional flora, *Flora Mesoamericana*, in 1995. Investigation of the dates of discovery for each taxon produces a graph that indicates many more taxa are yet to be discovered in the country. A preliminary assessment is made of areas in Belize likely to reveal new records.

INTRODUCTION

The vascular plants of Belize have never been treated adequately in a national flora. Early botanical investigation during the nineteenth century was focussed very much on economically important species, especially timber, latex and fruit, though the list produced for the now defunct Botanic Station by Campbell (1899) included a number of native ferns and orchids. Other early accounts of the flora (Blake, 1917; Record, 1925), based on exploration and forestry, excluded pteridophytes. Standley & Record (1936) provided a good floristic grounding for the country with the *Forests and flora of British Honduras*, though this lacks some of the elements of a regular flora and the content is biased strongly towards trees both in species coverage and detail. Herbaceous angiosperms and pteridophytes are merely listed, except where they are believed to be new species. However, this single publication provided the earliest published record for almost 25% of species in the entire flora, far exceeding the significance of any other publication for Belize in this respect. A number of checklists have appeared subsequently for the country. Those by Dwyer and others (Spellman et al., 1975; Dwyer & Spellman, 1981) excluded pteridophytes, but some records appear in the catalogue by Schipp (1934). The catalogue of the Belize National Herbarium (BRH) by Vargas & Shawe (1997) includes a number of plant records for the country not published elsewhere.

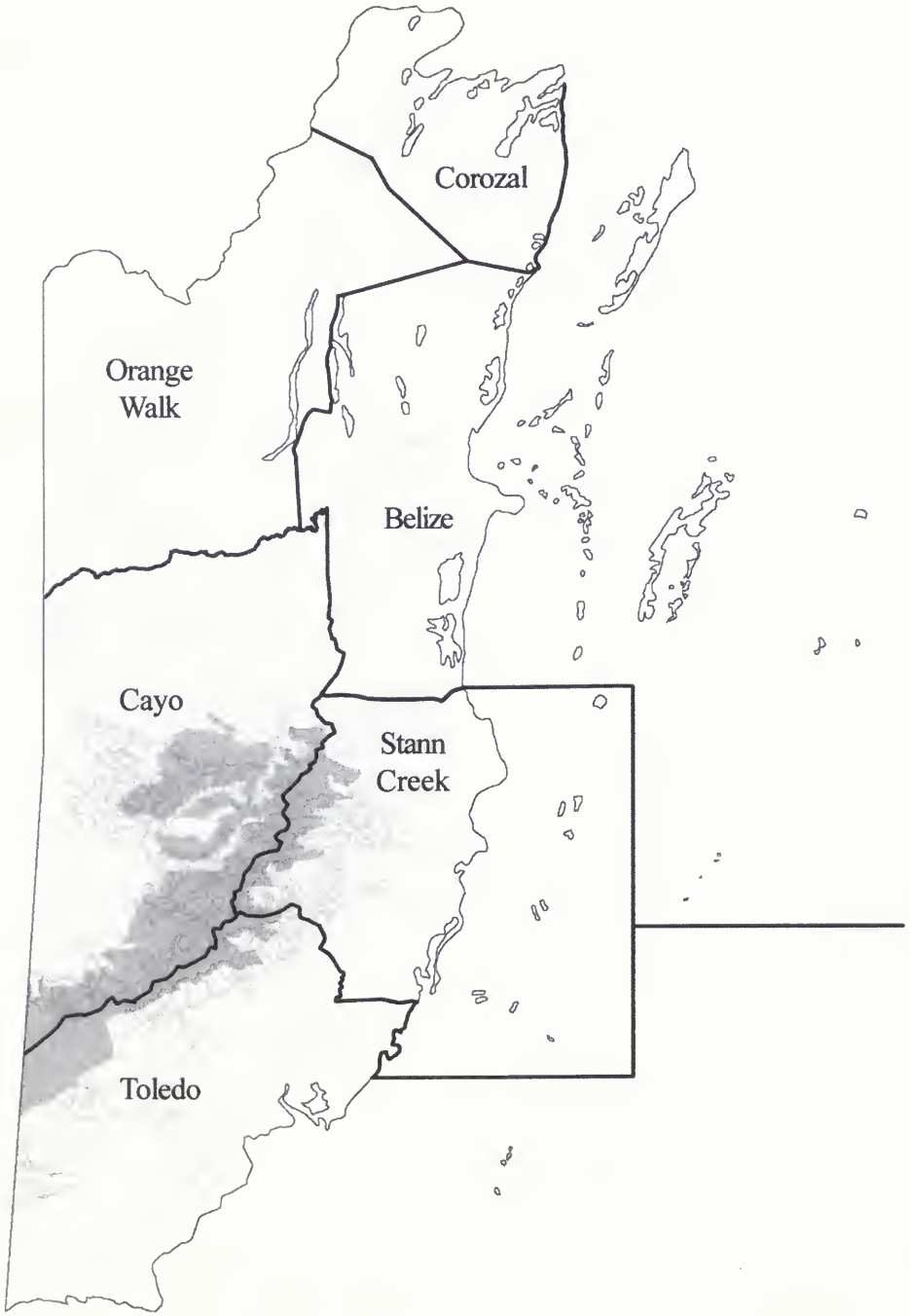

Fig. 1 Districts of Belize. Shaded areas represent 300 m and 600 m contours.

Recent expedition reports and surveys (for example Parker et al., 1993) include many of the new records of pteridophytes for the country.

The regional Flora of Guatemala expressly included Belize (as British Honduras) in its remit (for example, Standley & Steyermark 1958) though for the majority of pteridophyte taxa listed (Mickel, 1981; Smith, 1981*b*; Stolze, 1976, 1981, 1983; Stolze & Hickey, 1983; Øllgaard, 1983) there is no explicit mention of the presence in or absence from Belize. For most vascular plants, this publication still provides the most complete coverage of the flora for Belize to date, though for pteridophyes it has been superseded by the regional *Flora Mesoamericana* (Davidse et al., 1994, 1995). This latter project will provide a comprehensive coverage of the species of Belize on its eventual completion and it has a unique strength in the development of a live link to the TROPICOS (Solomon et al., 2000) database in 1998, so that the Internet version of the flora is updated on a continual basis.

Since the publication of the volume of *Flora Mesoamericana*, there has been considerable interest in the pteridophytes of Belize arising out of a number of projects (for example, Hughes, 1998) and recent fieldwork. A list of current names used for Belize, with an indication of their status is given below. The report includes an analysis of over 2500 pteridophyte specimen records from The Natural History Museum in London (BM) and other herbaria at AAU, B, BR, BRH, CR, DS, F, G, GH, K, LAGU, MEXU, MICH, MO, NY, S, SEL, TEX, UAMIZ, UC, UCWI, US and Z. Full use has been made of information sources on the Internet, and the authors particularly express their gratitude to Missouri Botanical Garden for making TROPICOS available on the World Wide Web.

LIST OF TAXA

The following list is arranged alphabetically by family following the family delimitation used in *Flora Mesoamericana* (Davidse et al., 1995). Taxa previously recorded in *Flora Mesoamericana* are shown in italic and the superscript reference indicates the account and page number. Representative material is shown with one voucher for each district (Fig. 1) where the species has been recorded, except where the taxon has particular significance as a new record or endemic. Preference in citation is given to specimens cited in a monograph, revision or a recent regional flora. A superscript reference number or numbers following a specimen is to the source included in the bibliography where that specimen is listed. For new records not included in *Flora Mesoamericana*, the name is shown in bold and additional specimens are listed where known. An indication is given of where the taxon was first listed for Belize.

ASPLENIACEAE

Asplenium abscissum Willd., *Sp. pl.* **5**: 321 (1810)[2: 295]
Toledo, *G. Davidse & D.L. Holland* 36836 (MO[115]).

Asplenium auritum Sw. in *J. Bot. (Schrader)* **1800**(2): 52 (1801)[2: 297]
Cayo, *A. Hughes* 64 (BM-000557717![22]); Toledo, *T.B. Croat* 24260 (MO[2]).

Asplenium cirrhatum Rich. ex Willd., *Sp. pl.* **5**: 321 (1810)[2: 299]
Toledo, *B.H. Allen* 15443 (MO[2, 3, 115]).

Asplenium cristatum Lam., *Encycl.* **2**(1): 310 (1786)[2: 300]
Cayo, *A. Hughes* 98 (BM-000557710![22]); Stann Creek, *W.A. Schipp* 50 (BM[2], BRH[125], NY); Toledo, *B.K. Holst* 4397 (MO[91]).

Asplenium delitescens (Maxon) L.D. Gómez in *Brenesia* **8**: 52 (1976)[2: 301]
Cayo, *A. Hughes* 12 (BM-000531878!, BM-000557708![22], BRH!); Stann Creek, *P.H. Gentle* 2714 (F, GH, K[2], MICH, NY); Toledo, *P.H. Gentle* 6261 (F, G, NY, S, UC).

Asplenium dentatum L., *Sp. pl.* **2**: 1080–1081 (1753)
Stann Creek, *P.H. Gentle* 2712 (NY); Toledo, *T.E. Hawkins* 1631 (MO[115]).
A new name for *Asplenium trichomanes-dentatum* L., listed for Belize in *Flora Mesoamericana* (Adams, 1995*b*: 322) based on extralimital distribution in Proctor (1985: 375) but without reference to a specimen. The name is automatically corrected according to the International Code of Botanical Nomenclature (Tokyo Code 23.8, ex. 14, Greuter et al., 1998). Vargas & Shawe (1997: 22) listed a specimen (*W.A. Schipp* 1066, BRH) under the name *A. dentatum* L., but this material has also been identified as *A. macilentum* by Adams (1995*b*: 309) based on a duplicate at K.

Asplenium formosum Willd., *Sp. pl.* **5**: 329 (1810)[2: 304]
Cayo, *G.R. Proctor* 29902 (BM[2]); Stann Creek, *R. Rivero* et al. 2576 (BRH[125]); Toledo, *G. Davidse* 35782 (MO[115]).

Asplenium heterochroum Kunze in *Linnaea* **9**: 67 (1834)[2: 306]
Cayo, *A. Hughes* 148 (BM-000557731![22]); Stann Creek, *W.A. Schipp* 211 (BM[2], BRH[125]); Toledo, *G. Davidse & A.E. Brant* 32131 (MO[115]).

Asplenium juglandifolium Lam., *Encycl.* **2**(1): 307 (1786)[2: 308]
Toledo, *B.K. Holst* 4027 (MO[91, 115]).

Asplenium laetum Sw., *Syn. fil.*: 79, 271 (1806)[2: 308]
Stann Creek, *W.A. Schipp* S-277 (B[115]); Toledo, *P.H. Gentle* 7378 (BM[2, 115], F[115], G[115], MICH[115], NY[115], S[115], UC[115]).

Asplenium macilentum Kunze ex Klotzsch in *Linnaea* **20**: 351 (1847)[2: 309]
Toledo, *W.A. Schipp* 1066 (BRH[125], K[2], NY).
Adams (1995: 309–310) considered that material cited as *A. monodon* Liebm. was more closely related to *A. macilentum* than *A. auritum*, although it was included as a synonym in the latter taxon by Stolze (1981: 60). It is not clear if *A. monodon* occurs in Central America and the name may have been misapplied.

Asplenium palmeri Maxon in *Contr. U.S. Natl. Herb.* **13**: 39 (1909)[2: 313]
First recorded for Belize in extralimital distribution for the *Pteridophyte flora of Oaxaca, Mexico* (Mickel & Beitel, 1988: 65) but without explicit reference to specimens. Vargas & Shawe (1997: 22) list a specimen collected in 1929 from the Stann Creek District (*W.A. Schipp* 211, BRH) under this name, but a duplicate at BM has been identified as *A. heterochroum* by Adams (1995*b*: 306). Material needs to be located to support the record for Belize.

Asplenium pteropus Kaulf., *Enum. filic.*: 170 (1824)[2: 314]
Stann Creek, *W.A. Schipp* 365 (MO[2], NY); Toledo, *B.K. Holst* et al. 5195 (MO[115]).

Asplenium punilum Sw., *Prodr.*: 129 (1788)[2: 315]
Cayo, *A. Hughes* 136 (BM!); Toledo, *T. Arnason & J. Lambert* 17182 (MO[2]), *G. Davidse & B.K. Holst* 36181 (MO[115]).

Asplenium riparium Liebm. in *Kongel. Danske Vidensk. Selsk. Skr., Naturvidensk. Math. Afd.* ser. 5, **1**: 244 (1849)
Toledo, *G. Davidse & D.L. Holland* 36837 (MO[115]), *B.K. Holst* 5332 (MO[115]).
Not previously recorded from Belize in the Central American literature, but material collected from Toledo District in 1996 and 1997 is listed in TROPICOS and identified as this taxon by A.R. Smith in 1997.

Asplenium salicifolium L., *Sp. pl.* **2**: 1080 (1753)[2: 318]

Asplenium salicifolium var. *salicifolium*[2: 319]
Cayo, T.B. Croat 23773 (MO[2]).

Asplenium serra Langsd. & Fisch., *Pl. Voy. Russes monde* **1**: 16, t. 19 (1810)[2: 319]

Cayo, *B.H. Allen* 15177 (BM-000543291!, MO[2, 3, 115]).

Asplenium serratum L., *Sp. pl.* **2**: 1079 (1753)[2: 319]
Cayo, *C.L. Lundell* 6235 (MICH[28], NY); Stann Creek, *R. Rivero* et al. 2602 (BRH[125]); Toledo, *C. Whitefoord* 1625 (BM-000543328![2]).

Asplenium uniseriale Raddi in *Opusc. Sci.* **3**: 291 (1819)
Toledo, *B.K. Holst* 5321 (MO[115], UC[115]).
Not listed for Belize in the published version of *Flora Mesoamericana* (Adams, 1995*b*: 323), but included in the Internet version based on a specimen collected in 1996 from Toledo District.

BLECHNACEAE

Blechnum* × *antillanum Proctor in *Brit. Fern Gaz.* **9**: 214 (1965)
Cayo, *G.R. Proctor* 29904 (BRH[125]).
Interpreted in *Flora Mesoamericana* (Moran, 1995*ae*: 329) as a hybrid between *B. meridense* and *B. glandulosum* and expected from Mesoamerica. Vargas & Shawe (1997: 31) listed an unpublished herbarium name with the epithet 'antillense' attributed to G.R. Proctor and based on a specimen (cited above, collected in 1968 from Rio Frio Caves in Cayo District) which apparently equates to Proctor's *Blechnum* × *antillanum*. However, of the putative parent species, only *B. meridense* has been recorded from Belize and the status of this specimen is uncertain.

Blechnum × *caudatum* Cav., *Descr. pl.*: 262 (1802)[67: 326]
Cayo, *A. Hughes* 34 (BM-000531849!).

Blechnum ensiforme (Liebm.) C. Chr., *Index filic.*: 153 (1905)
Toledo, *G. Davidse & D.L. Holland* 36781 (MO[115], UC[115]).
Not recorded from Belize in the published version of *Flora Mesoamericana* (Moran, 1995*ae*: 327), but included in the Internet version based on a specimen (*G. Davidse & D.L. Holland* 36781, UC) collected from Toledo District in 1997 and identified by A.R. Smith in the same year.

Blechnum fragile (Liebm.) C.V. Morton & Lellinger in *Amer. Fern J.* **57**: 68 (1967)[67: 328]
Cayo, *B.H. Allen* 15204 (MO[3, 67, 115]); Toledo, *B.K. Holst* et al. 5303 (MO[115]).

Blechnum gracile Kaulf., *Enum. filic.*: 158 (1824)[67: 328]
Toledo, *G. Davidse & A.E. Brant* 31915 (MO[67, 115]).

Blechnum meridense Klotzsch in *Linnaea* **20**: 349 (1847)
Toledo, *G. Davidse* 36979 (MO[115], UC), *D.L. Holland* 65 (MO[115]), *D.L. Holland & B. Kid* 100 (MO[115]).
Not recorded from Belize in the published version of *Flora Mesoamericana* (Moran, 1995*ae*: 329), but included in the Internet version based on a specimen (*G. Davidse* 36979, UC) collected from Toledo District in 1997 and identified by A.R. Smith in the same year.

Blechnum occidentale L., *Sp. pl.* **2**: 1077 (1753)[67: 329]
Cayo, *A. Hughes* 93 (BM-000531830!, BM-000531837!); Stann Creek, *W.A. Schipp* 162 (BRH[125], NY); Toledo, *G. Davidse & A.E. Brant* 32304 (MO[67, 115]).

Blechnum polypodioides Raddi in *Opusc. Sci.* **3**: 294 (1819)[67: 329]
Cayo, *H.H. Bartlett* 11643 (US).
Moran (1995*af*: 329) did not base his record for this taxon on a specimen, but on extralimital distribution in *Flora of Chiapas* (Smith, 1981*a*: 60). The Bartlett specimen cited above is at US, and a duplicate is to be expected at MICH.

Blechnum serrulatum Rich. in *Actes Soc. Hist. Nat. Paris* **1**: 114 (1792)[67: 330]
Belize, *G. Davidse & A.E. Brant* 32999 (MO[67, 115]); Orange Walk, *G.R. Proctor* 35794 (BRH[125]); Stann Creek, *P.H. Gentle* 8227 (NY); Toledo, *G. Davidse & A.E. Brant* 32496 (MO[115]).

Salpichlaena volubilis (Kaulf.) J. Sm. in Hook. & Bauer, *Gen. fil.*: t. 93 (1841)[68: 332]
Toledo, *B.K. Holst* 4287 (MO[68, 91, 115]).

CYATHEACEAE

Alsophila firma (Baker) D.S. Conant in *J. Arnold Arbor.* **64**: 372 (1983)[101: 89]
Cayo, *B.H. Allen* 15221 (MO[3, 101, 115]); Stann Creek, *A.H. Gentry* 7958 (MO[115]); Toledo, *B.K. Holst* et al. 5301 (MO[115]).

Alsophila salvinii Hook. in Hook. & Baker, *Syn. fil.*: 36 (1866)
Toledo, *B.K. Holst* 5854 (MO[115]).
This Central American endemic was not recorded for Belize in *Flora Mesoamericana* (Riba, 1995*c*: 90), though it has been recorded from all surrounding countries and is included here based on a specimen collected in 1997 from Toledo District. Further material is to be expected from the wetter parts of the Maya Mountain divide and the *Liquidambar* forests.

Cyathea costaricensis (Mett. ex Kuhn) Domin in *Acta Bot. Bohem.* **9**: 107 (1930)[40: 96]
Stann Creek, *J.D. Dwyer* et al. 583 (MO[40, 115]).

Cyathea divergens Kunze in *Linnaea* **9**: 100 (1834)[40: 97]

Cyathea divergens var. *tuerckheimii* (Maxon) R.M. Tryon in *Contr. Gray Herb.* **206**: 56 (1976)[40: 97]
Cayo, B.*H. Allen* 15224 (MO[3, 40, 115]); Toledo, *B.K. Holst* et al. 5245 (MO[115]).

Cyathea microdonta (Desv.) Domin in *Pteridophyta*: 263 (1929)[40: 98]
Stann Creek, *J.D. Dwyer* et al. 549 (MO[40, 115]); Toledo, *P.H. Gentle* 1933 (NY).

Cyathea multiflora Sm. in *Mém. Acad. Roy. Sci. (Turin)* **5**(1790–1791): 416 (1793)[40: 99]
Cayo, *J. Meave* 1037 (MO[40, 115]); Toledo, *M.J. Balick* et al. 2543 (BRH[125], MO[115], NY).

Cyathea myosuroides (Liebm.) Domin in *Pteridophyta*: 263 (1929)[40: 99]
Cayo, *A. Hughes* 132a (BM-000531752!, BM-000531908!, BM-000531909!); Stann Creek, *W.A. Schipp* 191 (BRH[125], NY); Toledo, *B.K. Holst* 4285 (MO[91, 115]).

Cyathea schiedeana (C. Presl) Domin in *Pteridophyta*: 263 (1929)[40: 101]
Cayo, *J.D. Dwyer* 11431 (MO[40, 115]); Stann Creek, *P.H. Gentle* 8257 (NY); Toledo, *B.H. Allen* 15430 (MO[3, 115]).

Cyathea ursina (Maxon) Lellinger in *Amer. Fern J.* **77**: 101 (1987)[40: 102]
Stann Creek, *P.H. Gentle* 3197 (LL[40], MICH[23], MO-photograph[40, 115], US-holotype[23, 30, 120, 124]).
Reported only from the type collected from Antelope Ridge in the Stann Creek Valley of Belize, this Central American endemic occurs also in Guatemala and from Nicaragua to Panama.

Sphaeropteris horrida (Liebm.) R.M. Tryon in *Contr. Gray Herb.* **200**: 20 (1970)[89: 104]
Toledo, *B.K. Holst* 4213 (MO[89, 91, 115]).

DAVALLIACEAE

Nephrolepis biserrata (Sw.) Schott, *Gen. fil.*: t. 3 (1834)[80: 286]
Cayo, *A. Hughes* 130 (BM-000531755![22], BM-000531910!); Stann Creek, *W.A. Schipp* 394 (BRH[125], NY[80]); Toledo, *G. Davidse & A.E. Brant* 32193 (MO[115]).

Nephrolepis cordifolia (L.) C. Presl, *Tent. pterid.*: 79 (1836)[80: 287]
Cayo, *G.R. Proctor* 29881 (BRH[125]); Toledo, *D.E. Breedlove & D.C. McClintock* 23670 (DS[80]).

Nephrolepis multiflora (Roxb.) F.M. Jarrett ex C.V. Morton in *Contr. U.S. Natl. Herb.* **38**: 309 (1974)[80: 287]
Cayo, *A. Hughes* 67 (BM-000531799!, BM-000557718![22]); Stann

Creek, *R. Rivero* et al. 2536 (BRH[125]); Toledo, *B.K. Holst* 4507 (MO[80, 91, 115]).

Nephrolepis pendula (Raddi) J. Sm. in *J. Bot. (Hooker)* **4**: 197 (1841)[80: 288]
Cayo, *C.L. Lundell* 6305 (MICH[28], NY[80]); Toledo, *M.E. Peck* 538 (NY).

Nephrolepis rivularis (Vahl) Mett. ex Krug in *Bot. Jahrb. Syst.* **24**: 122 (1897)
Toledo, *G. Davidse* 36876 (MO[115], UC), *T.E. Hawkins* 1425 (MO[115]).
Not recorded for Belize in the published version of *Flora Mesoamericana* (Nauman, 1995: 288), although included in the Internet version on the basis of material collected in 1997 from Toledo District and identified by A.R Smith in 1997 and 1998.

Nephrolepis undulata (Afzel. ex Sw.) J. Sm. in *Bot. Mag.* **72**(Companion): 35 bis (1846)
Cayo, *A. Hughes* 104 (BM-000532008!).
Not recorded for Belize in *Flora Mesoamericana* (Nauman, 1995: 288), although recorded from all surrounding countries and to be expected in Belize. The material listed here from Cayo District is not fully fertile and confirmation of the identification is required from further collections.

Oleandra articulata (Sw.) C. Presl, *Tent. pterid.*: 78, t. 2, f. 12 (1836)[90: 289]
Toledo, *T.E. Hawkins* 1542 (MO[115]).

DENNSTAEDTIACEAE

Dennstaedtia bipinnata (Cav.) Maxon in *Proc. Biol. Soc. Wash.* **51**: 39 (1938)[47: 152]
Toledo, *B.K. Holst* 4474 (MO[47, 91, 115]).

Dennstaedtia cicutaria (Sw.) T. Moore, *Index fil.*: xcvii (1857)[47: 152]
Toledo, *W.A. Schipp* S-802 (GH[47, 115]).

Dennstaedtia dissecta (Sw.) T. Moore, *Index fil.*: 305 (1861)[47: 152]
Stann Creek, *R. Rivero* et al. 2587A (BRH[125]); Toledo, *W.A. Schipp* S-921 (GH[47, 115]).

Hypolepis repens (L.) C. Presl, *Tent. pterid.*: 162 (1836)[48: 156]
Stann Creek, *R. Rivero* et al. 2532 (BRH[125]); Toledo, *W.A. Schipp* 258 (GH[48, 115], NY).

Lindsaea klotzschiana Moritz in Ettingsh., *Farnkr. Jetztw.*: 212, t. 145, f. 1–2 (1865)[49: 158]
Toledo, *B.K. Holst* 4265 (MO[49, 91, 115]).

Lindsaea lancea (L.) Bedd., *Suppl. ferns S. Ind.*: 6 (1876)[49: 158]

Lindsaea lancea var. *lancea*[49: 159]
Stann Creek, *W.A. Schipp* 100 (BRH[125], NY); Toledo, *C. Whitefoord* 1310 (BM, MO[49, 115]).

Lindsaea quadrangularis Raddi in *Opusc. Sci.* **3**: 294 (1819)[49: 159]

Lindsaea quadrangularis subsp. *subalata* K.U. Kramer in *Acta Bot. Neerl.* **6**: 190 (1957)[49: 159]
Stann Creek, *W.A. Schipp* 200 (BRH[125], F[49, 115], US); Toledo, *G. Davidse* 36247 (MO[115]).

Lindsaea stricta (Sw.) Dryand. in *Trans. Linn. Soc. London* **3**: 42 (1797)[49: 159]

Lindsaea stricta var. *stricta*[49: 159]
Belize, *P.H. Gentle* 1536 (K, NY); Cayo, *G. Davidse & A.E. Brant* 33024 (MO[49, 115]); Toledo, *G. Davidse & A.E. Brant* 31958 (MO[115]).

Lonchitis hirsuta L., *Sp. pl.* **2**: 1078 (1753)
Toledo, *G. Davidse & D.L. Holland* 36478 (MO[115]), *G. Davidse* 36888 (MO[115]), *G. Davidse* 36983 (MO[115], UC), *B.K. Holst* et al. 5516 (MO[115]).
Not listed for Belize in the published version of *Flora Mesoamericana* Moran (1995*n*: 160), but included in the Internet version on the basis of a collection from Toledo District (*G. Davidse* 36983, UC) in 1997 and identified by A.R. Smith in December 1997. This is the first record of the genus for Belize.

Odontosoria schlechtendalii (C. Presl) C. Chr., *Index filic.*: 209 (1905)[51: 161]
Toledo, *G. Davidse & A.E. Brant* 31986 (MO[51, 115], US).

Pteridium caudatum (L.) Maxon, in *Proc. U.S. Natl. Mus.* **23**(1226): 631 (1901)[52: 162]
Belize, *C. Whitefoord* 2452 (BM); Cayo, *A. Hughes* 65 (BM-000531794!, BM-000557716!); Stann Creek, *W.A. Schipp* 190 (BRH[125], NY); Toledo, *C. Whitefoord* 2204 (MO[52, 115]).

Saccoloma elegans Kaulf. in *Berlin. Jahrb. Pharm. Verbundenen Wiss.* **21**: 51 (1827)[53: 163]

Saccoloma elegans subsp. *chartaceum* G.B. Nair ex Cremers & K.U. Kramer, *Bot. Helvet.* **99**: 47 (1989)[53: 163]
Cayo, *T.B. Croat* 24577 (MO[53, 115]); Stann Creek, *W.A. Schipp* 90 (BRH[125], NY); Toledo, *P.H. Gentle* 9315 (NY).

Saccoloma inaequale (Kunze) Mett. in *Ann. Sci. Nat., Bot.* sér. 4, **15**: 80 (1861)[53: 163]
Toledo, *W.A. Schipp* 315 (MO[53, 115], US).

DICKSONIACEAE

Cibotium regale Verschaff. & Lem. in *Ill. Hort.* **15**: t. 548 (1868)
Cayo, *A.K. Monro & S. Cafferty* 2639 (BM-000543340!, BM-000543341!, BM-000543342!, BM-000543343!, BRH, LAGU, MEXU, MO).
Known formerly from Chiapas (including the type), Guatemala and Honduras to El Salvador (Pérez-García, 1995*b*: 86–87), this Central American endemic is restricted to mixed woodland of *Pinus*, *Quercus* and *Liquidambar*. The vegetation class occurs in Belize in the southern part of the Chiquibul Forest and probably will be found in other little-explored parts of the Maya Mountain Divide. Though the presence of *Liquidambar styraciflua* L. in Belize has been reported since the first half of the twentieth century (Stevenson, 1928) and Standley & Record (1936: 147) considered that it occurred 'in some abundance in the higher parts of the Cockscomb Mountains', material was not collected until very recently. A specimen can be found in the Belize National Herbarium (Belize: Cayo; *J.C. Meerman* s.n. (BRH), cf. Vargas & Shawe, 1997: 67). General collections from this class of vegetation were not made until 1998 by Monro and Cafferty, who provide the first record of *Cibotium regale*.

DRYOPTERIDACEAE

Arachniodes denticulata (Sw.) Ching in *Acta Bot. Sin.* **10**: 260 (1962)[59: 211]
Toledo, *B.H. Allen* 15391 (AAU[59, 115], MO[3, 115]).

Didymochlaena truncatula (Sw.) J. Sm. in *J. Bot. (Hooker)* **4**: 196 (1841)[60: 212]
Stann Creek, *W.A. Schipp* 406 (BRH[125], MO[60, 115]); Toledo, *B.K. Holst* et al. 5160 (BRH[115], MO[115], SEL).

Olfersia cervina (L.) Kunze in *Flora* **7**: 312 (1824)[61: 214]
Stann Creek, *W.A. Schipp* 402 (BRH[125], F[36, 61, 115], GH[36], MICH[36], NY[36], UC[36], US[36], Z[36]); Toledo, *G. Davidse & D.L. Holland* 36737 (MO[115]).

Polybotrya caudata Kunze in *Linnaea* **9**: 23 (1834)[62: 217]
Cayo, C.L. Lundell 6416 (MICH[28]); Stann Creek, *W.A. Schipp* 273 (BRH[125], F[62, 115]).

Polybotrya osmundacea Humb. & Bonpl. ex Willd., *Sp. pl.* **5**: 99 (1810)
Toledo, *B.K. Holst* 4048 (MO[91, 115]), *B.K. Holst* 4049 (MO[91, 115]).
Not recorded for Belize in *Flora Mesoamericana* (Moran, 1995*z*:

218), although the species was recorded for Toledo District by Parker et al. (1993) and material bearing this identification is at MO and listed in TROPICOS.

Polybotrya polybotryoides (Baker) H. Christ in *Bull. Herb. Boiss.* sér. 2, **1**: 70 (1901)[62: 218]
Cayo, *T.B. Croat* 24566 (MO[62, 115]); Toledo, *B.K. Holst* 4047 (MO[91, 115]).

Stigmatopteris sordida (Maxon) C. Chr., *Index filic., Suppl.* **3**: 175 (1934)
Toledo, *B.K. Holst* 5897 (MO[115], UC).
Not recorded for Belize in the published version of *Flora Mesoamericana* (Moran, 1995*aa*: 226), but included in the Internet version based on a specimen from Toldeo District (*B.K. Holst* 5897, UC) collected in 1997 and identified by A.R. Smith in December of the same year. This is also the first record of the genus from Belize.

GLEICHENIACEAE

Dicranopteris flexuosa (Schrad.) Underw. in *Bull. Torrey Bot. Club* **34**: 254 (1907)[38: 58]
Belize, *P.H. Gentle* 9558 (MO[38, 115], US).

Dicranopteris pectinata (Willd.) Underw. in *Bull. Torrey Bot. Club* **34**: 260 (1907)[38: 58]
Cayo, *C.L. Lundell* 6603 (MICH[28], NY, US); Stann Creek, *W.A. Schipp* 350 (BRH[125], K!, NY, US); Toledo, *D.L. Spellman & W.W. Newey* 1648 (MO[38, 115]).

Stricherus palmatus (J.H. Schaffn. ex Underw.) Copel., *Gen. fil. (Ann. Cryptog. Phytopathol. 5)*: 28 (1947)[39: 61]
Toledo, *B.K. Holst* 4270 (MO[39, 91, 115]).

GRAMMITIDACEAE

Cochlidium linearifolium (Desv.) Maxon ex C. Chr. in *Dansk Botanisk Arkiv* **6**(3): 23 (1929)[6: 371]
Cayo, *G. Davidse & A.E. Brant* 33087 (MO[115]); Toledo, *B.H. Allen* 15304 (MO[3, 6, 115]).

Cochlidium serrulatum (Sw.) L.E. Bishop in *Amer. Fern J.* **68**: 80 (1978)[6: 372]
Cayo, *G. Davidse & A.E. Brant* 33088 (MO[115]); Toledo, *W.A. Schipp* 213 (NY, UC[6]).

Enterosora ecostata (Sodiro) L.E. Bishop in *Syst. Bot.* **17**(3): 348, f. 1A-C (1992)[112: 373]
Toledo, *W.A. Schipp* S-801[a] (F[117], GH[129]).

Lellingeria mitchellae (Baker ex Hemsl.) A.R. Sm. & R.C. Moran in *Amer. Fern J.* **81**: 85 (1991)[77: 378]
Cayo, *A. Hughes* 48 (BM-000531771!); Orange Walk, *Mitchell s.n.* (K-holotype[10, 19, 77, 106]); Toledo, *G. Davidse* 36126 (MO[115]).
Based on a Belizean type, this Central American endemic occurs from Chiapas to Panama and is unique in having setulose sporangia capsules.

Micropolypodium taenifolium (Jenman) A.R. Sm. in *Novon* **2**: 423 (1992)
Toledo, *G. Davidse & D.L. Holland* 36701 (MO[115]), 36782 (MO[115]), *T.E. Hawkins* 1526 (MO[115]), *B.K. Holst* et al. 5248 (MO[115]).
Not included in *Flora Mesoamericana* (Smith, 1995*b*: 384) but included here on the basis of material collected from Toledo District in 1996–1997 and identified by A.R. Smith in 1997–1998. This is the first record of the genus from Belize.

Terpsichore asplenifolia (L.) A.R. Sm. in *Novon* **3**: 485 (1993)[114: 387]
Cayo, *B.H. Allen* 15174 (MO[3, 114, 115]); Toledo, *B.K. Holst* et al. 5189 (MO[115]).

Terpsichore lehmanniana (Hieron.) A.R. Sm. in *Novon* **3**: 487 (1993)[114: 389]
Cayo, *B.H. Allen* 15215 (MO[3, 114, 115]); Toledo, *G. Davidse & D.L. Holland* 36738 (MO[115]).

Terpsichore mollissima (Fée) A.R. Sm. in *Novon* **3**: 487 (1993)[114: 390]
Toledo, *B.K. Holst* 4040 (MO[91, 115]).

HYMENOPHYLLACEAE

Hymenophyllum abruptum Hook., *Sp. fil.* **1**: 88, t. 31B (1844)[84: 64]
Cayo, *H.H. Bartlett* 11751 (F[84, 115]).

Hymenophyllum fucoides (Sw.) Sw. in *J. Bot. (Schrader)* **1800**(2): 99 (1801)[84: 66]
Toledo, *B.H. Allen* 15305 (MO[3, 84, 115]).

Hymenophyllum hirsutum (L.) Sw. in *J. Bot. (Schrader)* **1800**(2): 99 (1801)[84: 66]
Cayo, *B.H. Allen* 15203A (MO[3, 84, 115]); Toledo, *B.K. Holst* et al. 5304 (MO[115]).

Hymenophyllum polyanthos (Sw.) Sw. in *J. Bot. (Schrader)* **1800**(2): 102 (1801)[84: 68]
Cayo, *C. Whitefoord* 9141 (BM); Stann Creek, *W.A. Schipp* 114 (F[84, 115]); Toledo, *G. Davidse* 36124 (MO[115]).

Hymenophyllum pulchellum Schltdl. & Cham. in *Linnaea* **5**: 618 (1830)[84: 68]
Toledo, *B.K. Holst* 4041 (MO[84, 91, 115]).

Hymenophyllum sieberi (C. Presl) Boschin in *Ned. Kruidk. Arch.* **4**: 414 (1858).
Toledo, *B.K. Holst* et al. 5296 (BRH[115], MO[115], UC[115]), *B.K. Holst* 5974 (MO[115]).
Not listed for Belize in the published version of *Flora Mesoamericana* (Pacheco, 1995*a*: 69), *H. sieberi* is included in the Internet version on the basis of a collection from Toledo District (*B.K. Holst* et al. 5296, UC) made in 1996 and identified by A.R. Smith in May 1997.

Trichomanes ankersii C. Parker ex Hook. & Grev., *Icon. filic.* **2**(11): t. 201 (1831)
No material has been collected from this far north in Central America according to *Flora Mesoamericana* (Pacheco, 1995*b*: 73), though it is recorded from Nicaragua to Panama. Standley & Record (1936: 60) listed the taxon for Belize but without explicit reference to a specimen. There may be material at F, though this needs further investigation to verify the identification.

Trichomanes capillaceum L., *Sp. pl.* **2**: 1099 (1753)[85: 73]

Trichomanes capillaceum var. *capillaceum*[85: 74]
Toledo, *B.H. Allen* 15411 (MO[3, 85, 115]).

Trichomanes collariatum Bosch in *Ned. Kruidk. Arch.* **4**: 368 (1858)[85: 74]
Stann Creek, *W.A. Schipp* 364 (BM-000543308!, K!, NY); Toledo, *M.E. Peck* 601 (F[85, 115], K!).

Trichomanes crispum L., *Sp. pl.* **2**: 1097 (1753)[85: 74]
Cayo, *B.H. Allen* 15172 (MO[3, 115]); Toledo, *B.K. Holst* 4023 (MO[85, 91, 115]).

Trichomanes curtii Rosenst. in *Repert. Spec. Nov. Regni Veg.* **22**(606–608): 5 (1925)[85: 75]
No specimen was listed for Belize in *Flora Mesoamericana* (Pacheco, 1995*b*: 75), but reference is made to *Flora of Guatemala* (Stolze, 1976: 78). The latter author also did not cite material, but made explicit reference to 'British Honduras'. There may be supporting material at F. *Trichomanes curtii* is also recorded from Chiapas and Guatemala, extending southeast from Nicaragua to Colombia.

Trichomanes diaphanum Kunth in Humb., Bonpl. & Kunth, *Nov. Gen. Sp.* **1**: 25 (1816)[85: 75]
Toledo, *B.K. Holst* et al. 5214 (MO[115]).

Trichomanes diversifrons (Bory) Mett. ex Sadeb. in Engl. & Prantl, *Nat. Pflanzenfam.* **1**(4): 108 (1899)[85: 75]
Belize, *C. Whitefoord* 1210 (BM-000543306!); Stann Creek, *W.A. Schipp* 237 (K!, NY); Toledo, *T.B. Croat* 24514 (F[85, 115]).

Trichomanes ekmanii Wess. Boer in *Acta Bot. Neerl.* **11**: 319, f. 33 (1962)[85: 75]
Stann Creek, *W.A. Schipp* 324 (BM-000543311!, BRH[125], K, MO[85, 115], NY).

Trichomanes elegans Rich.in *Actes Soc. Hist. Nat. Paris* **1**: 114 (1792)
Toledo, *E.J.F. Campbell* s.n. (K!), *Mitchell* s.n. (K!).
First collected from Belize in 1875 (*Mitchell* s.n., K!) but not recorded in any subsequent publication for the country either as an accepted name, a synonym or as a misapplied name. *Trichomanes elegans* has previously been recorded in Central America from Honduras to Panama (Pacheco, 1995*b*: 75), from South America and the Caribbean region, and is to be expected from Belize.

Trichomanes galeottii E. Fourn. in *Bull. Soc. Bot. France* **15**: 147–148 (1868)[85: 76]
Cayo, *H.H. Bartlett* 11640 (MO[85, 115]); Stann Creek, *W.A. Schipp* 482 (BM-000543305!, BRH[125], NY); Toledo, *G. Davidse & A.E. Brant* 32238 (MO[115]).

Trichomanes godmanii Hook. in Baker in *J. Linn. Soc., Bot.* **9**: 337, t. 8A (1866)[85: 76]
Cayo, *C.L. Lundell* 6187 (MICH[28], NY); Toledo, *F. Boutin & Schlosser* 5023 (MO[85, 115]).

Trichomanes hymenoides Hedw., *Fil. gen. sp.*: t. 3, f. 3 (1799)[85: 77]
No specimen was listed for Belize in *Flora Mesoamericana* (Pacheco, 1995*b*: 77), but reference is made to Stolze (1976: 81–82) who explicitly cited 'British Honduras' in the distribution for *Flora of Guatemala*, but did not mention any material. There may be a specimen at F to verify the occurrence in Belize.

Trichomanes krausii Hook. & Grev., *Icon. filic.* **2**: t. 149 (1830)
Cayo, *T.E. Hawkins* 1179 (MO[115]); Orange Walk, *C. Whitefoord* 8095 (BM-000543310!); Toledo, *C. Whitefoord* 1984 (BM-000543309!).
Recorded for Belize since *Forests and flora of British Honduras* (Standley & Record, 1936: 61). Stolze (1976: 83) gave the distribution as 'Mexico to Panama', which may be taken as an implicit reference to Belize though no material was listed for 'British Honduras'. Pacheco (1995*b*: 78) did not list the species for Belize in the published version of *Flora Mesoamericana*, though several specimens have been collected recently and appear on TROPICOS.

Trichomanes membranaceum L., *Sp. pl.* **2**: 1097 (1753)[85: 78]
Stann Creek, *W.A. Schipp* S-108 (F[85, 115]).

Trichomanes ovale (E. Fourn.) Wess. Boer in *Acta Bot. Neerl.* **11**: 296 (1962)
Toledo, *C. Whitefoord* 1244 (BM, MO[115]).
Not recorded for Belize in the published version of *Flora Mesoamericana* (Pacheco, 1995*b*: 79) but material collected in 1976 (*C. Whitefoord* 1244, MO) is added to the Internet version as an extended range record.

Trichomanes pinnatum Hedw., *Fil. gen. sp.*: t. 4, f. 1 (1799)[85: 80]
Cayo, *H.H. Bartlett* 11726 (NY); Stann Creek, *W.A. Schipp* 359 (K!, MO[85, 115], NY); Toledo, *E.J.F. Campbell* 86 (K!).

Trichomanes polypodioides L., *Sp. pl.* **2**: 1098 (1753)[85: 80]
Stann Creek, *W.A. Schipp* S-83 (F[85, 115], K!); Toledo, *B.K. Holst* et al. 5193 (MO[115]).

Trichomanes punctatum Poir. in Lam., *Encycl.* **8**: 64 (1808)[85: 80]

Trichomanes punctatum subsp. *sphenoides* (Kunze) Wess. Boer in *Acta Bot. Neerl.* **11**: 301 (1962)[85: 81]
Cayo, *A. Hughes* 129 (BM-000557729!); Toledo, *B.H. Allen* 15442 (MO[3, 85, 115]).

Trichomanes pyxidiferum L., *Sp. pl.* **2**: 1098 (1753)[85: 81]
Cayo, *A. Hughes* 126 (BM-000557730!); Toledo, *B.K. Holst* 4310 (MO[85, 91, 115]).

Trichomanes radicans Sw. in *J. Bot. (Schrader)* **1800**(2): 97 (1801)
Toledo, *B.K. Holst* 5815 (MO[115], UC), *B.K. Holst* 5816 (MO[115]).
Not recorded for Belize in the published version of *Flora Mesoamericana* (Pacheco, 1995*b*: 81) but included in the Internet version. The first record for the country is material collected from Toledo District on vertical rocks in waterfall spray (*B.K. Holst* 5815, UC) in 1997, and identified by A.R. Smith in December of the same year.

Trichomanes rigidum Sw., *Prodr.*: 137 (1788)[85: 82]
Cayo, *B.H. Allen* 15186 (MO[3, 115]); Toledo, *B.K. Holst* et al. 5197 (MO[115]).

Trichomanes tuerckheimii H. Christ in *Hedwigia* **44**: 361 (1905)[85: 83]
Belize, *C. Whitefoord* 1298 (BM-000543313!, MO[115]); Stann Creek, *W.A. Schipp* S-21 (F[85, 115], US); Toledo, *G. Davidse & M. Meadows* 35841 (MO[115]).

ISOËTACEAE

Isoëtes cubana Engelm. ex Baker in *J. Bot.* **18**: 110 (1880)[21: 42]
Toledo, *M.E. Peck* 420 (GH[21], NY).

LOMARIOPSIDACEAE

Bolbitis bernoullii (Kuhn ex H. Christ) Ching in C. Chr., *Index filic., Suppl.* **3**: 47 (1934)[20: 248]
Toledo, *W.A. Schipp* S-776 (GH[20, 115]).

Bolbitis hastata (E. Fourn.) Hennipman in *Amer. Fern J.* **65**: 1975 (1975)
Toledo, *B.K. Holst* 5757 (MO[115], UC).
Not recorded for Belize in the published version of *Flora Mesoamericana* (Hennipman & Moran, 1995: 248), but included in the Internet version based on a specimen (*B.K. Holst* 5757, UC) collected from Toledo District in 1997 and identified by A.R. Smith later that year.

Bolbitis hemiotis (Maxon) Ching in C. Chr., *Index filic., Suppl.* **3**: 48 (1934)[20: 248]
Toledo, *B.H. Allen* 15441 (MO[3, 20, 115]).

Bolbitis pergamentacea (Maxon) Ching in C. Chr., *Index filic., Suppl.* **3**: 49 (1934)[20: 249]
Toledo, *W.A. Schipp* S-764 (GH[20, 115]).

Bolbitis portoricensis (Spreng.) Hennipman in *Amer. Fern J.* **65**: 30 (1975)[20: 249]
Stann Creek, *W.A. Schipp* 526 (BRH[125], NY); Toledo, *G. Davidse & A.E. Brant* 32381 (MO[20, 115]).

Elaphoglossum christianeae Mickel in *Novon* **2**: 371 (1992)
Toledo, *G. Davidse & H.B. Buchanan* 36941 (MO[115]).
Not recorded for Belize in *Flora Mesoamericana* (Mickel, 1995*a*: 263), this Central American endemic has been recorded formerly from Costa Rica and Panama but to that distribution can be added a specimen collected in Toledo District of Belize in 1997 and identified by A.F. Rojas-Alvarado in 1998.

Elaphoglossum decursivum Mickel in *Brittonia* **32**: 334 (1980)
Toledo, *G. Davidse & D.L. Holland* 36729 (MO[115]), *D.L. Holland & B. Kid* 90 (MO[115]), *B.K. Holst* 5924 (MO[115]).
This taxon is not recorded for Central America in the published version of *Flora Mesoamericana* (Mickel, 1995*a*), but appended to the Internet version on the basis of recent identifications by A.R. Smith of material from Belize, Honduras and Costa Rica.

All of the Belize material listed above was collected in 1997 from Toledo District.

Elaphoglossum erinaceum (Fée) T. Moore, *Index fil.*: 9 (1857)
Toledo, *G. Davidse & D.L. Holland* 36764 (MO[115]).
Not included in the published version of *Flora Mesoamericana* (Mickel, 1995*a*: 265) but listed for Belize in the Internet version based on the collection listed above from Toledo District made in 1997 and identified by A.R. Smith in 1998.

Elaphoglossum eximiiforme Mickel in *Novon* **2**: 374 (1992)
Toledo, *B.K. Holst* 5672 (MO[115]).
Not recorded for Belize in *Flora Mesoamericana* (Mickel, 1995*a*: 265), this Central American endemic was formerly known only from Costa Rica and Panama. The material included here was originally identified as *E. latifolium* (Sw.) Sm. by A.R. Smith but re-determined as *E. eximiiforme* by A.F. Rojas-Alvarado in October 1998.

Elaphoglossum glaucum T. Moore, *Index fil.*: 10 (1857)
Toledo, *B.K. Holst* 3869 (MO[91, 115]).
Not recorded for Belize in *Flora Mesoamericana* (Mickel, 1995*a*: 267), though recorded from the neighbouring countries of Mexico, Guatemala and Honduras. The record here is tentative as it is based on material from Toledo District identifed by R. Moran in 1992 and cited by Parker et al. (1993: 40), yet excluded from the flora.

Elaphoglossum guatemalense (Klotzsch) T. Moore in *Parker's Cat.* (1858)[32: 268]
Cayo, *B.H. Allen* 15175 (MO[3, 115]); Toledo, *G. Davidse & A.E. Brant* 32239 (MO[32, 115]).

Elaphoglossum herminieri (Bory ex Fée) T. Moore, *Index fil.*: xvi (1857)[32: 268]
Toledo, *F. Boutin & Schlosser* 5088 (NY[32]).

Elaphoglossum herrerae A. Rojas in *Brenesia* **45–46**: 13, f. 5 (1996)
Toledo, *B.K. Holst* 5670 (MO[115]).
A new species provisionally included in the Internet version of *Flora Mesoamericana* based on a specimen from Toledo District listed above and identified by A.F. Rojas-Alvarado in October 1998. This taxon was originally considered to be endemic to the Cordillera de Guanacaste in Costa Rica.

Elaphoglossum latifolium (Sw.) J. Sm. in *London J. Bot.* **1**: 197 (1842)[32: 270]
Toledo, *P.H. Gentle* 3756 (NY[32]).

Elaphoglossum latum (Mickel) Atehortúa ex Mickel in *Fieldiana, Bot.* n.s., **27**: 123 (1991)[32: 271]
Toledo, *T.B. Croat* 24313 (MO[32, 115]).

Lomariopsis japurensis (Mart.) Sm., *Hist. fil.*: 140 (1875)[66: 284]
Toledo, *T.B. Croat* 24393 (MO[66, 115]).

Lomariopsis recurvata Fée, *Mém. Foug.* **2**: 68 (1845)[66: 284]
Cayo, *T.B. Croat* 23800 (MO[66]); Stann Creek, *R. Rivero* et al. 2524 (BRH[125]); Toledo, *B.K. Holst* 4417 (MO[91, 115]).

Lomariopsis vestita E. Fourn. in *Bull. Soc. Bot. France* **19**: 250 (1872)[66: 284]
Toledo, *F. Boutin & Schlosser* 5093 (MO[66, 115]).

Peltapteris peltata (Sw.) C.V. Morton in *Amer. Fern J.* **45**: 13 (1955)
Cayo, *B.H. Allen* 15275 (BM-000543333, MO[3, 115]); Toledo, *C. Whitefoord* 1727 (BM-000543338!).
Curiously omitted for Belize in *Flora Mesoamericana* (Mickel, 1995*b*: 285) although it was cited under the name *Elaphoglossum peltatum* (Sw.) Urb. by Parker et al. (1993: 40) and there are many specimens listed under the same synonym in TROPICOS. The earliest collection from Belize seen to date (*C.W. Whitefoord* 1727, BM) was collected in May 1979. Mickel listed four separate forms of this species, but the northern material from Mexico, Guatemala and Honduras all falls within typical forma *peltata*.

LOPHOSORIACEAE

Lophosoria quadripinnata (J.F. Gmel.) C. Chr., *Nat. Hist. Juan Fernandez* **2**: 16 (1920)

Lophosoria quadripinnata var. ***quadripinnata***
Toledo, *T.E. Hawkins* 1540 (MO[115], UC).
Not listed for Belize in the published version of *Flora Mesoamericana* (Riba, 1995*a*: 85), but included in the Internet version on the basis of a collection from Toledo District (*T.E. Hawkins* 1540, UC) made in 1996 and identified by A.R. Smith in January 1998. This is the first record of both the genus and the family for Belize.

LYCOPODIACEAE

Huperzia dichaeoides (Maxon) Holub in *Folia Geobot. Phytotax.* **20**: 72 (1985)[82: 11]
Toledo, *B.H. Allen* 15384 (BM-000543283!, MO[3, 82, 115]).

Huperzia dichotoma (Jacq.) Trevis. in *Atti Soc. Ital. Sci. Nat.* **17**: 248 (1874)[82: 11]
Toledo, *P.H. Gentle* 3034 (GH[82, 115]).

Huperzia linifolia (L.) Trevis. in *Atti Soc. Ital. Sci. Nat.* **17**: 248 (1874)[82: 13]

Huperzia linifolia var. *linifolia*[82: 13]
Cayo, *B.H. Allen* 15280 (MO[3, 115]); Toledo, *W.A. Schipp* 811 (US[82, 115]).

Huperzia pithyoides (Schltdl. & Cham.) Holub in *Folia Geobot. Phytotax.* **20**: 76 (1985)
Toledo, *B.K. Holst* 4381 (MO[91]).
Not listed for Belize in *Flora Mesoamericana* (Øllgaard, 1995*a*: 15) though it was recorded from all surrounding countries and to be expected from Belize. *Huperzia pithyoides* was first cited for the country by Parker et al. (1993: 40) based on the specimen listed above collected from the Columbia River Forest Reserve in Toledo District.

Huperzia reflexa (Lam.) Trevis. in *Atti Soc. Ital. Sci. Nat.* **17**: 248 (1874)[82: 16]

Huperzia reflexa var. *reflexa*[82: 16]
Toledo, *M.C. Carlson* 2617 (F[82, 115]).

Huperzia taxifolia (Sw.) Trevis. in *Atti Soc. Ital. Sci. Nat.* **17**: 248 (1874)[82: 17]
Cayo, *C.L. Lundell* 6258 (MICH[28], NY[82, 115]); Toledo, *G. Davidse* 36384 (MO[115]).

Lycopodiella caroliniana (L.) Pic. Serm., *Webbia* **23**: 165 (1968)[83: 19]

Lycopodiella caroliniana var. *meridionalis* (Underw. & F.E. Lloyd) B. Øllg. & P.G. Windisch in *Bradea* **5**: 27 (1987)[83: 19]
Belize, *C. Whitefoord* 2405 (BM-000543290!); Cayo, *G. Davidse & A.E. Brant* 33079 (BM-000543288!, BM-000543289!, MO[115]); Stann Creek, *W.A. Schipp* 578 (BM-000543286!, MO[115], NY, S[83, 115]).

Lycopodiella cernua (L.) Pic. Serm. in *Webbia* **23**: 166 (1968)[83: 19]
Belize, *C. Whitefoord* 2570 (BM-000543294!); Cayo, J.N. Hedger 127 (BM-000543297!); Stann Creek, *W.A. Schipp* 234 (BM-000543243!, NY); Toledo, *P.H. Gentle* 6781 (BM-000543244!, NY).

MARATTIACEAE

Danaea elliptica Sm. in Rees, *Cycl.* **11**: Danaea no. 2 (1808)[9: 49]
Cayo, *C. Whitefoord* 1215 (BM-000543246!); Stann Creek, *T.B. Croat* 24525 (MO[9, 115]); Toledo, *B.K. Holst* 4305 (MO[91, 115]).

Danaea nodosa (L.) Sm. in *Mém. Acad. Roy. Sci. (Turin)* **5**(1790–1791): 420, t. 9, f. 11 (1793)[9: 49]
Cayo, *B.H. Allen* 15185 (MO[3, 115]); Stann Creek, *W.A. Schipp* 422 (F[9, 115], US); Toledo, *B.K. Holst* et al. 5503 (MO[115]).

Marattia excavata Underw. in Britton, *N. Amer. fl.* **16**(1): 22 (1909)
Toledo, *B.K. Holst* et al. 5300 (BRH[115], MO[115], UC[115]).
Not listed for Belize in the published version of *Flora Mesoamericana*, (Pérez-García, 1995*a*: 50) but included in the Internet version on the basis of a collection from Toledo District (*B.K. Holst* et al. 5300, UC) made in 1996 and identified by A.R. Smith in April 1997. This is the first record of the genus in Belize. The specimen is cited as 'B (Holst et al. 5300, US)' in the Internet description but it is not clear from the TROPICOS account if there is a duplicate at US or if this is an error for UC.

METAXYACEAE

Metaxya rostrata (Kunth) C. Presl, *Tent. pterid.*: 60, t. 1, f. 5 (1836)[100: 86]
Cayo, *D. Burch* 5881 (MO[115], NY); Stann Creek, *W.A. Schipp* 89 (BRH[125], NY); Toledo, *P.H. Gentle* 2631 (GH[100]).

OPHIOGLOSSACEAE

Cheiroglossa palmata (L.) C. Presl, *Suppl. tent. pterid.*: 57 (1845)[126: 46]
Cayo, *B.H. Allen* 15170 (AAU[126], MO[3, 115]); Toledo, *B.K. Holst* 5935 (MO[115]).

Ophioglossum nudicaule L.f., *Suppl. pl.*: 433 (1782)[126: 47]
Belize, *C. Whitefoord* 2605 (BM-000543245!); Stann Creek, *P.H. Gentle* 2997 (MO[115, 126]).

POLYPODIACEAE

Campyloneurum angustifolium (Sw.) Fée, *Mém. Foug.* **5**: 257 (1852)[25: 335]
Cayo, *D.R. Hunt* 7054 (K!); Toledo, *T.E. Hawkins* 1348 (MO[115]).

Campyloneurum aphanophlebium (Kunze) T. Moore, *Index fil.*: 223 (1861)[25: 335]
Toledo, *P.H. Gentle* 7327 (US[25]).

Campyloneurum brevifolium (Lodd. ex Link) Link, *Fil. spec.*: 124 (1841)[25: 335]
Cayo, *A. Hughes* 96 (BM-000531759!, BM-000531835!); Stann Creek, *W.A. Schipp* 527 (BRH[125], K); Toledo, *P.H. Gentle* 7835 (F[25], US).

Campyloneurum costatum (Kunze) C. Presl, *Tent. pterid.*: 190 (1836)[25: 336]
Toledo, *P.H. Gentle* 6792 (US[25]).

Campyloneurum fasciale (Humb. & Bonpl. ex Willd.) C. Presl, *Tent. pterid.*: 190 (1836)[25: 336]
Cayo, *C. Whitefoord* 2044 (BM, MO[25]); Toledo, *G. Davidse* 36003 (MO[115]).

Campyloneurum phyllitidis (L.) C. Presl, *Tent. pterid.*: 190 (1836)[25: 337]
Belize, *C.L. Lundell* s.n. (K!); Cayo, *A. Hughes* 25b (BM-000531767!); Toledo, *P.H. Gentle* 1108 (F[25], K).

Campyloneurum repens (Aubl.) C. Presl, *Tent. pterid.*: 190 (1836)[25: 337]
Cayo, *C.L. Lundell* 6262 (MICH[28], US); Toledo, *T.B. Croat* 24462 (MO[25]).

Campyloneurum xalapense Fée, *Mém. Foug.* **5**: 258 (1852)[25: 337]
Toledo, *P.H. Gentle* 6515 (F[25], US).

Microgramma lycopodioides (L.) Copel., *Gen. fil. (Ann. Cryptog. Phytopathol. 5)*: 185 (1947)[69: 339]
Cayo, *C.L. Lundell* 6287 (MICH[28], NY); Stann Creek, *R. Rivero* et al. 2555 (BRH[125]); Toledo, *C. Whitefoord* 1863 (BM, CR[69]).

Microgramma nitida (J. Sm.) A.R. Sm. in *Proc. Calif. Acad. Sci.* ser. 4, **40**(8): 230 (1975)[69: 339]
Orange Walk, *G. Davidse & A.E. Brant* 32765 (MO[115]); Toledo, *D.L. Spellman* & W.W. Newey 2105 (MO[69]).

Microgramma percussa (Cav.) de la Sota in *Physis (A, B & C)* **44**(106, Secc. C): 28 (1986)[69: 339]
Cayo, *A. Hughes* 77 (BM-000531808!, BM-000557711![22]); Toledo, *G. Davidse & A.E. Brant* 32027 (MO[69, 115]).

Microgramma reptans (Cav.) A.R. Sm. in *Proc. Calif. Acad. Sci.* ser. 4, **40**(8): 230 (1975)[69: 340]
Stann Creek, *W.A. Schipp* 210 (BRH[125], NY); Toledo, *C. Whitefoord* 1590 (BM, CR[69]).

Neurodium lanceolatum (L.) Fée, *Mém. Foug.* **3**: 28 (1852)[87: 341]
Cayo, *P.H. Gentle* 2518 (MEXU[87, 115], NY); Toledo, *G. Davidse & A.E. Brant* 32346 (MO[115]).

Niphidium crassifolium (L.) Lellinger in *Amer. Fern J.* **62**: 106 (1972)[70: 341]
Cayo, *A. Hughes* 21 (BM-000531766![22], BM-000531797!); Stann Creek, *W.A. Schipp* 88 (BRH[125]); Toledo, *P.H. Gentle* 4964 (MO[70, 115]).

Niphidium oblanceolatum A. Rojas in *Brenesia* **45–46**: 28, f. 1 (1996)
The protologue of this recently described species includes Belize in the distribution, and the taxon is provisionally accepted for the Internet version of *Flora Mesoamericana*.

Pecluma atra (A.M. Evans) M.G. Price in *Amer. Fern J.* **73**: 113 (1983)[71: 342]
Cayo, *C.L. Lundell* 6639 (GH, MICH[28], US-1638286[15, 71]); Toledo, *M.E. Peck* 820 (NY).

Pecluma dispersa (A.M. Evans) M.G. Price in *Amer. Fern J.* **73**: 114 (1983)[71: 343]
Cayo, *A. Hughes* 38 (BM-000531768![22], BM-000531855!); Toledo, *T.B. Croat* 24176 (MO[71, 115]).

Pecluma divaricata (E. Fourn.) Mickel & Beitel in *Mem. New York Bot. Gard.* **46**: 269 (1988)[71: 343]
Toledo, *B.K. Holst* 4460 (MO[71, 91, 115]).

Pecluma pectinata (L.) M.G. Price in *Amer. Fern J.* **73**: 115 (1983)
Cayo, *D.R. Hunt* 605 (BM), *G.R. Proctor* 29841 (BRH[125]).
Not recorded for Belize in *Flora Mesoamericana* (Moran, 1995*ai*: 344) though specimens have been collected under the synonym *Polypodium pectinatum* L. This record requires further investigation.

Pecluma plumula (Humb. & Bonpl. ex Willd.) M.G. Price in *Amer. Fern J.* **73**: 115 (1983)[71: 345]
Belize, *C. Whitefoord* 1242 (BM); Cayo, *A. Hughes* 120 (BM-000557724![22]); Corozal, *G. Davidse & A.E. Brant* 32534 (MO[71, 115]); Orange Walk, *C.L. Lundell* 537 (NY); Toledo, *T.E. Hawkins* 1717 (MO[115]).

Phlebodium decumanum (Willd.) J. Sm. in *J. Bot. (Hooker)* **4**: 59 (1841)[72: 345]
Toledo, *A.H. Gentry* 88 (F[72]).

Pleopeltis astrolepis (Liebm.) E. Fourn., *Méxic. pl.* **1**: 87 (1872)[26: 347]
Cayo, *C.L. Lundell* 6450 (MICH[28], NY[26]); Toledo, *W.A. Schipp* 923 (BRH[125], MO[115]).

Pleopeltis crassinervata (Fée) T. Moore, *Index fil.*: 345 (1862)
Not recorded from Belize in *Flora Mesoamericana* (Lorea Hernández, 1995: 348). This taxon was originally described from Mexico and listed by Weatherby (1922) from Veracruz, Chiapas and Guatemala. Lorea Hernández expanded this distribution to include Honduras, Nicaragua and Costa Rica. Seymour (1975: 167) had listed Weatherby's combination for the taxon in his notes on the genus *Polypodium* in Nicaragua, but with the incorrect epithet 'crassinervum'. It is clear from the exact reference to Weatherby that this taxon is intended, and Seymour listed Central American material including a specimen from 'British Honduras' at GH. This material needs locating and the identification verifying.

× ***Pleuroderris michleriana*** (D.C. Eaton) Maxon in *J. Wash. Acad. Sci.* **24**: 551, f. 1–2 (1934), pro sp.
Stann Creek, *R. Rivero* et al. 2571 (BRH[125]), 2608 (BRH[125]).
Hybridization between *Tectaria incisa* and *Dictyoxiphium panamense* produces the very variable intrageneric hybrid × *Pleuroderris michleriana* (Wagner et al., 1978). It was not recorded for Belize by Moran (1995*t*: 201, 1995*v*: 207) though both parental species are present in the area.

Polypodium dissimile L., *Syst. nat.* 10th ed., **2**: 1325 (1759)[73: 355]
Cayo, *B.H. Allen* 15173 (MO[3, 115]); Toledo, *B.K. Holst* 4034 (MO[73, 91, 115]).

Polypodium dulce Poir. in Lam., *Encycl.* **5**: 523 (1804)[73: 352]
Toledo, *F. Boutin & Schlosser* 5022 (MO[73, 115]).

Polypodium fallax Schltdl. & Cham. in *Linnaea* **5**: 609 (1830)[73: 361]
Cayo, *C.L. Lundell* 6216 (MICH[28], NY); Toledo, *C. Whitefoord* 1745 (BM, NY).

Polypodium fraternum Schltdl. & Cham. in *Linnaea* **5**: 608 (1830)[73: 358]
Cayo, *A. Hughes* 121 (BM-000532009!).

Polypodium fraxinifolium Jacq., *Collectanea* **3**: 187 (1791)
Toledo, *G. Davidse & D.L. Holland* 36729A (MO[115]), *T.E. Hawkins* 1427 (MO[115]), 1429 (MO[115]), *B.K. Holst* et al. 5257 (MO[115]).
Not listed for Belize in the published version of *Flora Mesoamericana* (Moran, 1995*ak*: 355), but included in the Internet version on the basis of a collection from Toledo District (*Davidse & Holland* 36729A, MO) made in 1997 and identified by A.R. Smith in January 1998.

Polypodium hispidulum Bartlett in *Proc. Amer. Acad. Arts* **43**: 48 (1907)
Cayo, *T.E. Hawkins* 1078 (MO[115], UC); Toledo, *T.E. Hawkins* 1330 (MO[115]).
Not listed for Belize in the published version of *Flora Mesoamericana* (Moran, 1995*ak*: 358), but included in the Internet version on the basis of a collection from Cayo District (*T.E. Hawkins* 1078, UC) made in 1996 and identified by A.R. Smith in December 1997.

Polypodium lindenianum Kunze, *Farrnkräuter* **2**: 83 (1849)[73: 362]
Cayo, *A. Hughes* 131 (BM-000557728![22]); Toledo, *G. Davidse* et al. 35704 (MO[115]).

Polypodium polypodioides (L.) Watt in *Canad. Naturalist & Quart. J. Sci.* ser. 2, **3**: 158 (1867)[73: 363]

Polypodium polypodioides var. ***aciculare*** Weath. in *Contr. Gray Herb.* **124**: 33 (1939)
Not recorded for Belize in *Flora Mesoamericana*, though present in Chiapas, Guatemala and Honduras and to be expected from Belize. Seymour (1975: 160) cited material of *P. polypodioides* var. *burchellii* (Baker) Weath. from countries of Central America in his treatment of the genus *Polypodium* for Nicaragua, and included reference to 'British Honduras' based on material at GH. Moran (1995*ak*: 364) considered that var. *burchellii* did not occur in Central America, but there is a note describing the confusion between this South American variety and var. *aciculare*. It is evident that Seymour's concept of var. *burchellii* falls under var. *aciculare* in *Flora Mesoamericana*, though the Belizean material at GH should be located to verify the identity.

Polypodium polypodioides var. *polypodioides*[73: 364]
Belize, *C.L. Lundell* 3884 (K!, NY); Cayo, *J.D. Dwyer & R.L. Liesner* 12092 (MO[73]); Stann Creek, *W.A. Schipp* 349 (BRH[125], K!, NY); Toledo, *P.H. Gentle* 906 (K!, NY).

Polypodium triseriale Sw. in *J. Bot. (Schrader)* **1800**(2): 26 (1801)[73: 357]
Cayo, *A. Hughes* 117 (BM-000531901!, BM-000557725![22]); Toledo, *P.H. Gentle* 5014 (MO[73, 115]).

Pseudocolysis bradeorum (Rosenst.) L.D. Gómez in *Brenesia* **10–11**: 116 (1977)[74: 365]
Recorded for Belize in *Flora Mesoamericana* (Moran, 1995*al*: 365) on the basis of the entry in *Flora of Guatemala* (Stolze, 1981: 381) where the distribution explicitly included 'British Honduras'. Stolze did not cite any material but made reference to Evans & Mickel (1969). Material was cited at GH from 'British Honduras' by Seymour (1975: 167), but without detail. This or other material should be sought to verify the distributional record for Belize.

PSILOTACEAE

Psilotum nudum (L.) P. Beauv., *Prodr. Aethéogam.*: 106, 112 (1805)[88: 3]
Belize, *G. Davidse & D.L. Holland* 37046 (MO[115]); Corozal, *G. Davidse & A.E. Brant* 32533 (MO[115]); Stann Creek, *R. Rivero* et al. 2613 (BRH[125]); Toledo, *W.A. Schipp* S-261 (MO[88, 115]).

PTERIDACEAE

Acrostichum aureum L., *Sp. pl.*: 1069 (1753)[41: 105]
Belize, *M.-H. Sachet & D.R. Stoddart* 1631 (BRH[125]); Stann Creek, *F.R. Fosberg & M.-H. Sachet* 53849 (BRH[125], MO[41, 115]); Toledo, *D.L. Spellman & D.R. Stoddart* 2299 (BRH[125]).

Acrostichum danaeifolium Langsd. & Fisch., *Pl. Voy. Russes monde* **1**: 5, t. 1 (1810)[41: 105]
Belize, *J.D. Dwyer* 11449 (MO[115]); Toledo, *D.L. Spellman & D.R. Stoddart* 2477 (MO[41, 115]).

Adiantopsis radiata (L.) Fée, *Mém. Foug.* **5**: 145 (1852)[86: 106]
Cayo, *T.B. Croat* 23775 (MO[86, 115]); Toledo, *P.H. Gentle* 6086 (MO[115]).

Adiantum capillus-veneris L., *Sp. pl.*: 1096 (1753)[78: 108]
Toledo, *B.K. Holst* 4014 (MO[78, 91, 115]).

Adiantum concinnum Humb. & Bonpl. ex Willd., *Sp. pl.* **5**: 451 (1810)[78: 109]
Cayo, *A. Hughes* 146 (BM-000528104![22], BM-000531933!).

Adiantum decoratum Maxon & Weath. in *Amer. J. Bot.* **19**: 165 (1932)[78: 113]
Toledo, *T.B. Croat* 24179 (MO[78, 115]).

Adiantum fructuosum Poepp. ex Spreng., *Syst. veg.* 16th ed., **4**(1): 113 (1827)[78: 114]
Toledo, *T.B. Croat* 24373 (BRH[125], MO[78, 115]).

Adiantum humile Kunze in *Linnaea* **9**: 80 (1834)[78: 114]
Toledo, *G. Davidse* 36082 (MO[115]).

Adiantum latifolium Lam., *Encycl.* **1**(1): 43 (1783)[78: 114]
Cayo, *C. Whitefoord* 2096 (BM-000543184![78, 115]); Orange Walk, *T. Arnason & J. Lambert* 17176 (MO[115]); Stann Creek, *W.A. Schipp* 77 (BM-000543186!, BRH[125], NY); Toledo, *C. Whitefoord* 1812 (BM-000543188!, MEXU).

Adiantum macrophyllum Sw., *Prodr.*: 135 (1788)[78: 112]
Cayo, *A. Hughes* 14 (BM-000528105![22]); Stann Creek, *W.A. Schipp* 340 (BM-000543254!, BRH[125], NY); Toledo, *C. Whitefoord* 1848 (BM-000543190!, MO[78, 115]).

Adiantum obliquum Willd., *Sp. pl.* **5**: 429 (1810)[78: 112]
Belize, *C. Whitefoord* 2366 (BM); Cayo, *A. Hughes* 70 (BM-000528106![22], BM-000531796!); Stann Creek, *W.A. Schipp* 275 (BM, BRH[125], MO[115], NY); Toledo, *C. Whitefoord* 1521 (BM-000543253![115]).

Adiantum petiolatum Desv. in *Ges. Naturf. Freunde Berlin Mag. Neuesten Entdeck. Gesammten Naturk.* **5**: 326–327 (1811)[78: 112]
Belize, *C. Whitefoord* 2569 (BM); Cayo, *A. Hughes* 62 (BM-000528100![22], BM-000531788!); Stann Creek, *R. Rivero* et al. 2595 (BRH[125]); Toledo, *G.R. Proctor* 36007 (BM-000543194!).

Adiantum princeps T. Moore in *Gard. Chron.* n.s., **4**: 197, f. 43–44 (1875)
Cayo, *M.J. Balick* et al. 3140 (MO[115], NY).

Not recorded for Belize by Moran in *Flora Mesoamericana* (Moran, Zimmer & Jermy 1995: 109), though the specimen listed here was collected in 1991 and identifed by J.T. Mickel in 1993.

Adiantum pulverulentum L., *Sp. pl.* **2**: 1096 (1753)[78: 115]
Cayo, *A. Hughes* 56 (BM-000528101![22], BM-000531791!); Stann Creek, *W.A. Schipp* 241 (BM-000543199!, BRH[125], NY); Toledo, *C. Whitefoord* 1524 (NY, BM-000543196!).

Adiantum tenerum Sw., *Prodr.*: 135 (1788)[78: 110]
Cayo, *D.A. Sutton* et al. 3 (BM-000543180!); Orange Walk, *M.J. Balick* 3219 (BRH[125], NY); Stann Creek, *M.J. Balick* 3091 (BRH[125], NY); Toledo, *G. Davidse & A.E. Brant* 32302 (MO[78, 115]).

Adiantum terminatum Kunze ex Miq. in *Verslagen Meded. Vier Kl. Kon. Inst. Wetensch. Letterk. Schoone Kunsten* **1842**: 187 (1843)[78: 116]
Toledo, *G.R. Proctor* 35922 (BRH[125], F[78, 115]).

Adiantum tetraphyllum Humb. & Bonpl. ex Willd., *Sp. pl.* **5**: 441 (1810)[78: 116]
Orange Walk, *C.L. Lundell* 404 (NY); Stann Creek, *R. Rivero* et al. 2523 (BRH[125]); Toledo, *B.K. Holst* 4360 (MO[91, 115]).

Adiantum trapeziforme L., *Sp. pl.* **2**: 1097 (1753)[78: 116]
Cayo, *P.H. Gentle* 2342 (F[78, 115], MO[115], NY); Toledo, *G. Davidse* 36198 (MO[115]).

Adiantum trichochlaenum Mickel & Beitel in *Mem. New York Bot. Gard.* **46**: 29, f. 41L (1988)
Toledo, *B.K. Holst* 5873 (MO[115]).
Jermy did not record this taxon from Belize in the published version of *Flora Mesoamericana* (Moran et al., 1995: 116), but it was included in the Internet version based on a collection made in 1997 from Toledo District and identified by A.R. Smith in the same year.

Adiantum tricholepis Fée, *Mém. Foug.* **8**: 72 (1857)[78: 110]
Cayo, *M. Brunt* 2219 (BM-000543178!); Orange Walk, *T. Arnason & J. Lambert* 17177 (MO[78, 115], NY); Toledo, *T.E. Hawkins* 1676 (MO[115]).

Adiantum villosum L., *Syst. nat.* 10th ed., **2**: 1328 (1759)[78: 117]
Cayo, *A. Hughes* 135 (BM-000528108![22], BM-000531916!); Orange Walk, *M.J. Balick* 3220 (BRH[125], NY); Toledo, *P.H. Gentle* 2409 (F[78, 115], NY).

Adiantum wilesianum Hook., *Sp. fil.* **2**: 50 (1851)[78: 117]
Belize, *P.H. Gentle* 1569 (MO[115], US); Cayo, *A. Hughes* 144b (BM-000528109!, BM-000531930!); Stann Creek, *W.A. Schipp* 48 (BM-000543267!, BRH[125], US); Toledo, *G. Davidse* et al. 36450 (BM-B000531990, BRH, MO[115]).

Adiantum wilsonii Hook., *Sp. fil.* **2**: 6 (1851)[78: 113]
Toledo, *C. Whitefoord* 1855 (BM-000543176![78, 115], NY).

Cheilanthes microphylla (Sw.) Sw., *Syn. fil.*: 127 (1806)[131: 127]

Cheilanthes microphylla var. *microphylla*[131: 127]
Cayo, *C.L. Lundell* 6542 (MICH[28, 121], US).

Cheilanthes notholaenoides (Desv.) Maxon ex Weath. in *Contr. Gray Herb.* **114**: 34 (1936)[131: 128]
Cayo, *A. Hughes* 92 (BM-000557720![22], BRH, RNG).

Hemionitis palmata L., *Sp. pl.*: 1077 (1753)[97: 132]
Stann Creek, *W.A. Schipp* 250 (BM-000543336!, BRH[125], MICH[97], MO[115]); Toledo, *C. Whitefoord* 1904 (BM-000543266!).

Pityrogramma calomelanos (L.) Link, *Handbuch* **3**: 20 (1833)[42: 138]

Pityrogramma calomelanos var. *calomelanos*[42: 138]
Belize, *P.H. Gentle* 1548 (K, NY); Cayo, *T.B. Croat* 24862 (MO[42, 115]); Stann Creek, *P.H. Gentle* 8372 (BM-000543264!, NY); Toledo, *B.K. Holst* et al. 35596 (MO[115]).

Pteris altissima Poir. in Lam., *Encycl.* **5**: 722 (1804)[43: 141]
Cayo, *A. Hughes* 72 (BM-000531762![22], BM-000531800!, BM-000531801!); Stann Creek, *J. Robertson* 231 (BM-000543191!); Toledo, *T.B. Croat* 23808 (MO[43, 115]).

Pteris biaurita L., *Sp. pl.*: 1076 (1753)[43: 141]
Cayo, *A. Hughes* 114 (BM-000531903!, BM-000557721![22]); Toledo, *P.H. Gentle* 2376 (US).

Pteris grandifolia L., *Sp. pl.* **2**: 1073 (1753)[43: 141]
Cayo, *A. Hughes* 37 (BM-000531758![22], BM-000531856!, BM-000531857!); Orange Walk, *C. Whitefoord* 8169 (BM-000543166!); Toledo, *P.H. Gentle* 1523 (K).

Pteris longifolia L., *Sp. pl.*: 1074 (1753)[43: 142]
Cayo, *A. Hughes* 81 (BM-000557714![22]); Orange Walk, *C. Whitefoord* 8168 (BM-000543171!); Stann Creek, *W.A. Schipp* 428 (BM-000543173!, BRH[125]); Toledo, *J.D. Dwyer* et al. 261 (MO[43, 115]).

Pteris propinqua J. Agardh, *Recens. spec. Pter.*: 65 (1839)
Toledo, *D.L. Holland* 14A (MO[115], UC).
Not included for Belize in the published version of *Flora Mesoamericana* (Moran, 1995*g*: 143) but included in the Internet version based on a collection from Toledo District (*D.L. Holland* 14A, UC) made in 1997 and determined by A.R. Smith.

Pteris pungens Willd., *Sp. pl.* **5**: 387 (1810)[43: 144]
Cayo, *D.R. Hunt* 607 (BM-000543170!); Stann Creek, *W.A. Schipp* 289 (BM-000543167!, BRH[125]); Toledo, *C. Whitefoord* 1849 (BM-000543169!).

Pteris quadriaurita Retz., *Observ. bot.* **6**: 38 (1791)[43: 144]
Toledo, *B.K. Holst* 3900 (MO[43, 91, 115]).

SALVINIACEAE

Salvinia auriculata Aubl., *Hist. pl. Guiane* **2**: 969 (1775)[75: 396]
Orange Walk, *G. Davidse & A.E. Brant* 32892 (MO[75, 115]).

Salvinia minima Baker in *J. Bot.* **24**: 98 (1886)[75: 396]
Belize, *G. Davidse & A.E. Brant* 33130 (MO[115]); Toledo, *C. Whitefoord* 2145 (BM, MO[75, 115]).

SCHIZAEACEAE

Actinostachys germanii Fée, *Mém. Foug.* **11**: 123 (1866)[102: 52]
Toledo, *M.E. Peck* 936 (GH[120]).

Anemia adiantifolia (L.) Sw., *Syn. fil.*: 157 (1806)[76: 53]
Belize, *P.H. Gentle* 1316 (K!, MO[76, 115]); Cayo, *A. Hughes* 83 (BM-000557706![22]); Toledo, *G. Davidse & A.E. Brant* 32322 (MO[115]).

Anemia bartlettii Mickel in *Iowa State J. Sci.* **36**: 420 (1962)[76: 54]
Cayo, *H.H. Bartlett* 11898 (MICH-holotype[76, 115], MICH-isotype, UC, US), *D.R. Hunt* 428 (BM, BRH, UCWI, US[120]), *J.R. Wiley* 402 (MO[76, 115]).
One of very few Belizean endemic taxa, this locally distributed fern from the Mountain Pine Ridge area in Cayo District was first collected in 1931. It was identified as *A. flexuousa* by Maxon (1944*a*: 17) and distributed under that name, but not recognized as a new species until 1962. The specimen cited in the distributional statement in *Flora Mesoamericana* (Moran & Mickel, 1995: 54) as 'B (*Wiley* 4402, MO)' is incorrect as the collections made by *J.R. Wiley* in August 1970 were less than 500 numbers and another record on TROPICOS correctly lists this as 402.

Anemia hirta (L.) Sw., *Syn. fil.*: 155 (1806)[76: 54]
Cayo, *D.A. Sutton* et al. 4 (BM-000543239!).

Anemia mexicana Klotzsch in *Linnaea* **18**: 526 (1844)[76: 55]

Anemia mexicana var. *makrinii* (Maxon) Mickel in *Brittonia* **33**: 421 (1981)[76: 55]
Cayo, *A. Hughes* 99 (BM-000531834!, BM-000557705![22]); Toledo, *G. Davidse & A.E. Brant* 32127 (MO[76, 115]).
Described originally from Mexico, this taxon has only been recorded from Belize for the *Flora Mesoamericana* area (Moran & Mickel, 1995: 55).

Anemia oblongifolia (Cav.) Sw., *Syn. fil.*: 156 (1806)[76: 55]
Cayo, J.N. Hedger 319 (BM-000543241!); Toledo, *J.R. Wiley* 351 (MO[76, 115]).

Anemia pastinacaria Moritz ex Prantl, *Unters. Morph. Gefässkrypt.* **2**: 110 (1881)[76: 55]
Cayo, *T.E. Hawkins* 1031 (MO[115]); Stann Creek, *W.A. Schipp* 366 (K!, MO[76, 115], NY).

Anemia speciosa C. Presl, *Suppl. tent. pterid.*: 89 (1846)[76: 56]
Cayo, *C.L. Lundell* 6906 (MICH[28], MO[76, 115], NY); Toledo, *B.K. Holst* et al. 35855 (MO[115]).

Lygodium heterodoxum Kunze, *Farrnkräuter* **2**: 32 (1849)[37: 56]
Cayo, *A. Hughes* 55 (BM-000531763![22]); Toledo, *G. Davidse* 36891 (BM-000531988!, MO[115]).

Lygodium venustum Sw. in *J. Bot.* **1801**(2): 303 (1803)[37: 57]
Belize, *F.P. Barlee* s.n. (K!); Cayo, *A. Hughes* 16 (BM-000531764![22], BM-000531880!); Corozal, *M.J. Balick* et al. 2190 (MO[115]); Orange Walk, *C. Whitefoord* 8054 (BM-000543272!, F); Stann Creek, *G.R. Proctor* 36566 (MO[115]); Toledo, *W.A. Schipp* 328 (MO[76, 115]).

Lygodium volubile Sw. in *J. Bot.* **1801**(2): 304 (1803)[37: 57]
Cayo, *C.L. Lundell* 6613 (MICH[28], NY); Stann Creek, *D.R. Hunt* 355 (BM-000543271!); Toledo, *B.K. Holst* et al. 35597 (MO[115]).

Schizaea elegans (Vahl) Sm. in *Mém. Acad. Roy. Sci. (Turin)* **5**(1790–1791): 419 (1793)[103: 57]
Stann Creek, *P.H. Gentle* 3487 (MEXU[103, 115], NY, US); Toledo, *E.J.F. Campbell* 10 (K!).

Schizaea poeppigiana J.W. Sturm in Mart., *Fl. bras.* **1**(2): 181 (1859)[103: 57]
Toledo, *G. Davidse & A.E. Brant* 32268 (MO[103, 115]).

SELAGINELLACEAE

Selaginella apoda (L.) Spring in Mart., *Fl. bras.* **1**(2): 119 (1840), as 'Selaginella apus'
Toledo, *C. Whitefoord* 3300 (BM-000543202!).
Not recorded for Belize by Fraile in *Flora Mesoamericana* (Fraile et al., 1995: 29) but present in Chiapas and Guatemala. The specimen listed here was identified by Fraile in 1987 yet not included in the flora; further investigation is required.

Selaginella cladorrhizans A. Braun in *Ann. Sci. Nat., Bot.* sér. 5, **3**: 282 (1865)[17: 30]
Cayo, *H.H. Bartlett* 11457 (BM[17, 115]); Toledo, *C. Whitefoord* 8359 (BM-000543203!).

Selaginella diffusa (C. Presl) Spring in *Bull. Acad. Roy. Sci. Bruxelles* **10**: 143 (1843)[17: 26]
Cayo, *B.H. Allen* 15208 (BM-000543206!, MO[3, 17, 115]).

Selaginella eurynota A. Braun in *Ann. Sci. Nat., Bot.* sér. 5, **3**: 293 (1865)
Toledo, *G. Davidse* 35970 (MO[115]), *G.R. Proctor* 36009 (BM-000543200!).
This Central American endemic was not recorded by Fraile for Belize in *Flora Mesoamericana* (Fraile et al., 1995: 26) but material was collected under this name in 1976 (*G.R. Proctor* 36009, BM!) and a subsequent collection in 1996 (*Davidse* 35970, MO) was determined as this taxon by A.R. Smith in 1997.

Selaginella flagellata Spring in *Bull. Acad. Roy. Sci. Bruxelles* **10**: 228 (1843)
Toledo, *B.K. Holst* et al. 5522 (MO[115]).
Fraile (Fraile et al., 1995: 32) did not record this taxon for Belize in *Flora Mesoamericana*, though it was listed from Chiapas and Guatemala. It is included here on the basis of a specimen collected from Toledo District in 1997 and determined by A.R. Smith in the same year.

Selaginella guatemalensis Baker in *J. Bot.* **21**: 243 (1883)[17: 33]
Toledo, *C. Whitefoord* 1664 (BM-000543249![17, 115], NY).

Selaginella harrisii Underw. & Hieron. in Urb., *Symb. antill.* **7**: 162 (1912)[17: 33]
Fraile (Fraile et al., 1995: 33) did not cite a specimen from Belize but referred to extralimital distribution in the *Pteridophyte flora of Oaxaca* (Mickel & Beitel, 1988: 341). Specimens need to be located to confirm the record.

Selaginella hoffmannii Hieron. in *Hedwigia* **41**: 41 (1902)[17: 33]
Cayo, *C. Whitefoord* 2059 (BM-000543204!).

Selaginella huehuetenangensis Hieron. in *Hedwigia* **43**: 32 (1904)[17: 34]
Belize, *C. Whitefoord* 2492 (BM-000543152!); Cayo, *H.H. Bartlett* 13032 (BM-000543154!); Toledo, *M.E. Peck* 634 (BM-000543155!).

Selaginella idiospora Alston in *Bull. Brit. Mus. (Nat. Hist.), Bot.* **1**: 246, t. 6 (1955)[17: 34]
Cayo, *C. Whitefoord* 1253 (BM-000543207![17, 115]); Toledo, *G. Davidse* 36100 (MO[115]).

Selaginella microdendron Baker in *J. Bot.* **23**: 116 (1885)[17: 35]
Stann Creek, *W.A. Schipp* 99 (BM-000543205![17, 115]); Toledo, *J.R. Wiley* 356 (MO[115]).

Selaginella mollis A. Braun in *Ann. Sci. Nat., Bot.* sér. 5, **3**: 276 (1865)[17: 36]
Belize, *C. Whitefoord* 2765 (BM-000543201!); Toledo, *W.A. Schipp* 925 (NY).

Selaginella ovifolia Baker in *J. Bot.* **22**: 90 (1884)[17: 37]
Toledo, *W.A. Schipp* 924[a] (BM[17, 115]).

Selaginella pallescens (C. Presl) Spring in Mart., *Fl. bras.* **1**(2): 132 (1840)[17: 37]

Selaginella pallescens var. *acutifolia* Stolze in *Amer. Fern J.* **71**: 51 (1981)[17: 37]
Cayo, *C. Whitefoord* 1255 (BM-000543211![17, 115]).

Selaginella pallescens var. *pallescens*[17: 37]
Belize, *T.B. Croat* 23835 (NY); Cayo, *C. Whitefoord* 1941 (BM-000543212![17, 115]); Toledo, *B.K. Holst* 3881 (MO[91, 115]).

Selaginella sertata Spring in *Mém. Acad. Roy. Soc. Belgique* **24**: 104 (1849)[17: 28]
Belize, *P.H. Gentle* 1396 (BM[17], NY); Cayo, *C. Whitefoord* 1091 (BM-000543209!); Orange Walk, *C.L. Lundell* 394 (NY); Toledo, *B.K. Holst* 4341 (MO[91, 115]).

Selaginella silvestris Aspl in *Ark. Bot.* **20A**(7): 30, f. 3–5 (1926)
Cayo, *G.R. Proctor* 30105 (BM-000543226!); Toledo, *C. Whitefoord* 1983 (BM-000543213!, NY).
Not recorded for Belize by Somers and Moran in the published version of *Flora Mesoamericana* (Fraile et al., 1995: 28), though many specimens have been collected recently from Toledo District and material from as early as 1969 (*G.R. Proctor* 30105, BM!) is known from the country.

Selaginella stellata Spring in *Flora* **21**: 194 (1838)[17: 28]
Stann Creek, *W.A. Schipp* 52 (BM-000543224!, MO[17], NY); Toledo, *C. Whitefoord* 1776 (BM-000543223!).

Selaginella umbrosa Lem. ex Hieron. in Engler & Prantl, *Nat. Pflanzenfam.* **1**(4): 683, f. 404 (1901)[17: 41]
Belize, *P.H. Gentle* 1552 (K, NY); Cayo, D.J. Lewis 43 (BM-000543221!); Orange Walk, *C.L. Lundell* 395 (NY); Stann Creek, *W.A. Schipp* 51 (BM-000543216!, NY); Toledo, *C. Whitefoord* 1851 (BM, MEXU[17], NY).

TECTARIACEAE

Ctenitis equestris (Kunze) Ching in *Sunyatsenia* **5**(4): 250 (1940)[54: 197]

Ctenitis equestris var. *equestris*[54: 197]

Stann Creek, *W.A. Schipp* 276 (BM-000543331!, BM-000543332!, BRH[125], MO[54, 115]).

Ctenitis excelsa (Desv.) Proctor in *Rhodora* **63**: 34 (1961)[54: 198]
Cayo, *J.D. Dwyer* 11200 (MO[54, 115]); Toledo, *G. Davidse* 36202 (MO[115]).

Ctenitis interjecta (C. Chr.) Ching in *Sunyatsenia* **5**(4): 250 (1940)[54: 198]
Toledo, *T.B. Croat* 24223 (MO[54, 115]).

Ctenitis melanosticta (Kunze) Copel., *Gen. fil. (Ann. Cryptog. Phytopathol. 5)*: 124 (1947)[54: 199]
Cayo, *T.B. Croat* 23320 (MO[54, 115]); Toledo, *B.K. Holst* et al. 35883 (MO[115]).

Ctenitis nigrovenia (H. Christ) Copel., *Gen. fil. (Ann. Cryptog. Phytopathol. 5)*: 124 (1947)[54: 199]
Cayo, *D.A. Sutton* et al. 7 (BM-000543335!, MO[54, 115]).

Ctenitis salvinii (Baker) Stolze in *Amer. Fern J.* **67**: 43 (1977)[54: 199]
Toledo, *B.K. Holst* 3890 (MO[91, 115]), *W.A. Schipp* S-773 (GH[54, 115]).

Cyclopeltis semicordata (Sw.) Sm. in *Bot. Mag.* **72**(Companion): 36 (1846)[55: 200]
Orange Walk, *M.J. Balick* 3222 (BRH[125], NY); Toledo, *J.D. Dwyer* 9921 (MO[55, 115]).

Dictyoxiphium panamense Hook., *Gen. fil.*: 62 (1840)[56: 201]
Stann Creek, *W.A. Schipp* 228 (BRH[125], NY); Toledo, *G. Davidse & A.E. Brant* 32211 (MO[56, 115]).

Lastreopsis effusa (Sw.) Tindale in *Victoria Naturalist* **73**: 184 (1957)[57: 201]
Cayo, *A. Hughes* 133 (BM-000557727![22]); Toledo, *T.B. Croat* 24463 (MO[57, 115]).

Lastreopsis exculta (Mett.) Tindale in *Victoria Naturalist* **73**: 185 (1957)

Lastreopsis exculta subsp. ***exculta***
Toledo, *G. Davidse* 35648 (MO[115]), *G. Davidse* 35799 (MO[115]), *G. Davidse* 36208 (MO[115]).
Recorded from Chiapas, Honduras and Guatemala in *Flora Mesoamericana* (Moran, 1995*u*: 202), but not from Belize. Included here on the basis of material collected from Toledo District and identified as *L. exculta* (Mett.) Tindale by A.R. Smith in 1997. Further material from Belize was identified as *L. exculta* subsp. *guatemalensis* (Baker) Tindale, though this name is included as a synonym of subsp. *exculta* by Moran.

Megalastrum lunense (H. Christ) A.R. Sm. & R.C. Moran in *Amer. Fern J.* **77**: 128 (1987)
Toledo, *B.K. Holst* 5820 (MO[115], UC).
This Central American endemic was not recorded for Belize in the published version of *Flora Mesoamericana* (Smith & Moran,1995*a*: 203), but included in the Internet version on the basis of a collection from Toledo District (*B.K. Holst* 5820, UC) made in February 1997 and identified by A.R. Smith later the same year. This is the first record of the genus from Belize.

Tectaria heracleifolia (Willd.) Underw. in *Bull. Torrey Bot. Club* **33**: 200 (1906)[58: 207]

Tectaria heracleifolia var. *heracleifolia*[58: 207]
Belize, *C. Whitefoord* 1163 (BM-000543323!); Cayo, *C. Whitefoord* 2034 (BM, MO[58, 115]); Orange Walk, *C.L. Lundell* 338 (NY); Toledo, *G. Davidse & D.L. Holland* 36495 (BM-000531986!, MO[115]).

Tectaria incisa Cav., *Descr. pl.*: 249 (1802)[58: 207]
Cayo, *D.L. Spellman & W.W. Newey* 1849 (MO[58, 115]); Stann Creek, *W.A. Schipp* 272 (BM-000543315!, BRH[125], NY); Toledo, *C. Whitefoord* 1583 (BM-000543316!).

Tectaria mexicana (Fée) C.V. Morton in *Amer. Fern J.* **56**: 133 (1966)[58: 207]
Belize, *P.H. Gentle* 1551 (K, NY); Cayo, *A. Hughes* 51 (BM-000531775![22], BM-000531780!); Toledo, *G. Davidse & A.E. Brant* 32371 (MO[58, 115]).

Tectaria nicotianifolia (Baker) C. Chr., *Index filic., Suppl.* **3**: 182 (1934)
Toledo, *G. Davidse & D.L. Holland* 36603 (UC[115]).
Not recorded for Belize in *Flora Mesoamericana* (Moran, 1995*v*: 208), but present in Guatemala, Honduras and from Nicaragua to Panama. Included in the Internet version based on the specimen from Toledo District listed above collected in 1997 and determined by A.R. Smith.

Tectaria pilosa (Fée) R.C. Moran in *Novon* **2**: 138 (1992)
Toledo, *G.R. Proctor* 36155 (BM-000543314!).
Only recorded for Costa Rica and Panama in *Flora Mesoamericana* (Moran, 1995*v*: 208), *T. pilosa* is listed here based on a collection from high forest in the Columbia Forest Reserve of Toledo, originally identified as *T. incisa* var. *pilosa* by G.R. Proctor. It differs from *T. heracleifolia* in the oblique or decurrent base to the terminal segment of the lamina and rather sparsely pilose upper and lower faces. Further investigation of this material is required.

Tectaria plantaginea (Jacq.) Maxon in *Contr. U.S. Natl. Herb.* **10**: 494 (1908)[58: 208]
Stann Creek, *W.A. Schipp* 465 (BRH[125], MO[58, 115], NY).

Tectaria rivalis (Mett. ex Kuhn) C. Chr., *Index filic., Suppl.* **3**: 184 (1934)[58: 208]
Cayo, *T.E. Hawkins* 1273 (MO[115]); Stann Creek, *W.A. Schipp* S-66 (BM-000543327!, F[58, 115], NY).

Tectaria vivipara Jermy & T.G. Walker in *Bull. Brit. Mus. (Nat. Hist.), Bot.* **13**: 274, f. 15 (1985)[58: 209]
Belize, *P.H. Gentle* 1542 (K, MO[58, 115], NY); Toledo, *C. Whitefoord* 1583 (BM, NY).

THELYPTERIDACEAE

Macrothelypteris torresiana (Gaud.) Ching in *Acta Phytotax. Sin.* **8**: 310 (1963)
Cayo, *A. Hughes* 143 (BM-000531924!, BM-000557726![22]); Toledo, *G. Davidse* 35918 (MO[115]).
Not recorded for Belize in *Flora Mesoamericana* (Smith, 1995*a*: 164). The species and genus were first listed for Belize by Hughes (1998) for the Chiquibul Forest Reserve and additional material is cited in TROPICOS based on identifications by A.R. Smith in 1997 and 1999.

Thelypteris balbisii (Spreng.) Ching in *Bull. Fan. Mem. Inst. Biol., Bot.* **10**: 250 (1941)[110: 170]
Stann Creek, *P.H. Gentle* 2720 (NY); Toledo, A.H. Gentry 7900 (UC[110]).

Thelypteris biolleyi (H. Christ) Proctor in *Bull. Inst. Jamaica, Sci. Ser.* **5**: 58 (1953)[110: 183]
Toledo, *G. Davidse & A.E. Brant* 32208 (MO[115], UC[110, 115]).

Thelypteris blanda (Fée) C.F. Reed in *Phytologia* **17**: 264 (1968)[110: 183]
Cayo, *A. Hughes* 113 (BM-000531751![22]); Toledo, *M.E. Peck* s.n. (US[110, 115]).

Thelypteris decussata (L.) Proctor in *Bull. Inst. Jamaica, Sci. Ser.* **5**: 59 (1953)

Thelypteris decussata var. ***costaricensis*** A.R. Sm.in *Univ. Calif. Publ. Bot.* **76**: 16 (1980)
Toledo, *B.K. Holst* 5919 (MO[115]).
This Central American endemic was not recorded for Belize in

the published version of *Flora Mesoamericana* (Smith, 1995*b*: 194), but was recorded from Honduras, Costa Rica and Panama. Belize was included in the Internet version based on a specimen collected from Toledo District listed here and identified by A.R. Smith in 1997. A second specimen (*Holst* 5819, MO), identified by A.R. Smith as *T. decussata* (L.) Proctor, may also be referable to var. *costaricensis*.

Thelypteris dentata (Forssk.) E.P. St. John in *Amer. Fern J.* **26**: 44 (1936)[110: 181]

Toledo, *G. Davidse* 36886 (MO[115]), *R. Rivero* 2539 (UC).

Not recorded for Belize in the published version of Flora Mesoamericana (Smith, 1995*b*: 181) but included in the Internet version based on a collection (*Rivero* et al. 2539, UC) identified by A.R. Smith in March 1996.

Thelypteris falcata (Liebm.) R.M. Tryon in *Rhodora* **69**: 6 (1967)[110: 192]

Stann Creek, *W.A. Schipp* 97 (BRH[125], NY); Toledo, *P.H. Gentle* 8693 (NY, UC[110]).

Thelypteris ghiesbreghtii (Hook.) C.V. Morton in *Contr. U.S. Natl. Herb.* **38**: 45 (1967)[110: 186]

Toledo, *W.A. Schipp* S-935 (GH[110], NY).

Thelypteris glandulosa (Desv.) Proctor in *Rhodora* **61**: 306 (1960)[110: 194]

Thelypteris glandulosa var. *brachyodus* (Kunze) A.R. Sm. in *Phytologia* **34**: 233 (1976)[110: 194]

Toledo, *W.A. Schipp* 362 (NY, UC[110, 115]).

Thelypteris hispidula (Decne) C.F. Reed in *Phytologia* **17**: 283 (1968)[110: 181]

Belize, *P.H. Gentle* 1460 (K!); Cayo, *A. Hughes* 88 (BM-000531822!, BM-000531828!, BM-000531829!, BM-000557715![22]); Toledo, A.H. Gentry 7978 (MO[110, 115], NY).

Thelypteris hondurensis L.D. Gómez in *Phytologia* **50**: 458 (1982)[110: 186]

Toledo, W.B. Crankshaw s.n. (CR[110, 115], NY).

Thelypteris kunthii (Desv.) C.V. Morton in *Contr. U.S. Natl. Herb.* **38**: 53 (1967)[110: 182]

Belize, *T.B. Croat* 23987 (UC[110, 115]); Cayo, *A. Hughes* 50a (BM-000531750![22], BM-000531773!); Toledo, *B.K. Holst* 6020 (MO[115]).

Thelypteris leprieurii (Hook.) R.M. Tryon in *Rhodora* **69**: 6 (1967)

Thelypteris leprieurii var. ***subcostalis*** A.R. Sm. in *Univ. Calif. Publ. Bot.* **76**: 26 (1980)

Toledo, *G. Davidse & D.L. Holland* 36788 (MO[115]), *T.E. Hawkins* 1536 (MO[115]).

Not recorded for Belize in the published version of Flora Mesoamericana (Smith, 1995*b*: 194), but included in the Internet version based on a subsequent collection from Toledo District (*G. Davidse & D.L. Holland* 36788, MO) identified by A.R. Smith in January 1998.

Thelypteris linkiana (C. Presl) R.M. Tryon in *Rhodora* **69**: 6 (1967)

Toledo, *D.L. Holland* 29 (MO[115], UC).

Not recorded for Belize in the published verion of *Flora Mesoamericana,* (Smith, 1995*b*: 174), but included in the Internet version based on a specimen collected subsequently from Toledo District (*D.L. Holland* 29, UC) and identified by A.R. Smith in December 1997.

Thelypteris meniscioides (Liebm.) C.F. Reed in *Phytologia* **17**: 292 (1968)

Toledo, *C. Whitefoord* 1518 (BM).

Not recorded for Belize in *Flora Mesoamericana* (Smith, 1995*b*: 186–187) though both *T. meniscioides* var. *meniscioides* (with a pinnate lamina) and the Guatemalan endemic *T. meniscioides* var. *ternata* A.R. Sm. (with a ternate lamina) are known from Guatemala.

Thelypteris nicaraguensis (E. Fourn.) C.V. Morton in *Contr. U.S. Natl. Herb.* **38**: 55 (1967)

Toledo, *B.K. Holst* 4324 (MO[91, 115]).

This Central American endemic was not recorded from Belize in *Flora Mesoamericana* (Smith, 1995*b*: 187) although it was listed for Chiapas and Honduras. The material listed here, collected in 1992, was identified by R.C. Moran under this name and cited by Parker et al. (1993: 41). The identity of this material requires confirmation.

Thelypteris obliterata (Sw.) Proctor in *Bull. Inst. Jamaica, Sci. Ser.* **5**: 62 (1953)[110: 187]

Stann Creek, *W.A. Schipp* 83 (BRH[125], NY); Toledo, *P.H. Gentle* 1458 (K, UC[110, 115]).

Thelypteris ovata R.P. St. John in Small, *Ferns s.e. states*: 230 (1930)[110: 182]

Thelypteris ovata var. *lindheimeri* (C. Chr.) A.R. Sm. in *Amer. Fern J.* **61**: 30 (1971)[110: 182]

Cayo, *P.H. Gentle* 2323 (GH[110, 115], K!, NY).

Thelypteris patens (Sw.) Small, *Ferns s.e. states*: 243 (1938)[110: 182]

Thelypteris patens var. *patens*[110: 182]

Cayo, *A. Hughes* 36a (BM-000531757![22], BM-000531850!); Toledo, *T.B. Croat* 24272 (UC[110, 115]).

Thelypteris patens var. ***smithiana*** Ponce in *Darwiniana* **28**: 373 (1987)

Cayo, *A. Hughes* 85 (BM-000532010!).

Central American material formerly identified as var. *scabriuscula* (C. Presl) A.R. Sm. was referred to var. *smithiana* by Smith (1995*b*: 182) on the basis of a sudy by Ponce (1987) who asserted that the type of var. *scabriuscula* was equivalent to *T. patens* var. *patens*. Material from Cayo District collected and identified as var. *scabriuscula* is included here in var. *smithiana*.

Thelypteris paucipinnata (Donn. Sm.) C.F. Reed in *Phytologia* **17**: 302 (1968)[110: 188]

Cayo, *A. Hughes* 112 (BM-000531896!, BM-000531897!, BM-000557704![22]); Toledo, *P.H. Gentle* 6550 (US[110]).

Thelypteris poiteana (Bory) Proctor in *Bull. Inst. Jamaica, Sci. Ser.* **5**: 63 (1953)[110: 188]

Cayo, *P.H. Gentle* 1457 (K, US[110, 115]); Orange Walk, *C.L. Lundell* 406 (US); Toledo, *C. Whitefoord* 1640 (BM).

Thelypteris praetermissa (Maxon) A.R. Sm. in *Phytologia* **34**: 232 (1976)[110: 188]

Belize, *P.H. Gentle* 9720 (US); Cayo, *H.H. Bartlett* 13104 (MICH[29, 110, 115], US- photograph[110, 115]); Stann Creek, *T.B. Croat* 24548 (UC[110, 115]); Toledo, *G. Davidse* & M. Meadows 35842 (MO[115]).

Based on a Belizean type (*Bartlett* 13104, MICH), *T. praetermissa* forms putative hybrids with *T. obliterata* and several specimens from Belize are interpreted as of hybrid origin by Smith (1995*b*: 188). Amongst several paratypes listed by Maxon (1944*a*: 20) is another Belizean specimen from close to the type locality (*H.H. Bartlett* 11878, MICH), yet Smith interpreted a duplicate at US as a hybrid.

Thelypteris reptans (J.F. Gmel.) C.V. Morton in *Fieldiana, Bot.* **28**: 12 (1951)[110: 189]

Cayo, *T.B. Croat* 23489 (UC[110, 115]); Toledo, *B.K. Holst* et al. 5496 (MO[115]).

Thelypteris resinifera (Desv.) Proctor in *Bull. Inst. Jamaica, Sci. Ser.* **5**: 63 (1953)[110: 177]

Cayo, *D.R. Hunt* 255 (US[110, 115]); Stann Creek, *P.H. Gentle* 2759 (US); Toledo, *G. Davidse & A.E. Brant* 31881 (MO[115]).

Thelypteris sancta (L.) Ching in *Bull. Fan. Mem. Inst. Biol., Bot.* **10**: 254 (1941)

Toledo, *B.K. Holst* 5968 (MO[115]), *C. Whitefoord* 1697 (BM).

Not recorded for Belize in the published version of *Flora Mesoamericana* (Smith, 1995*b*: 178), though included in the Internet version based on a specimen collected by Holst in 1997 and determined by A.R. Smith in the same year.

Thelypteris schippii (Weath.) A.R. Sm. in *Phytologia* **34**: 233 (1976)[110: 189]
Toledo, *W.A. Schipp* S-782 (GH[108, 110, 115, 129]).
Endemic to Toledo District in Belize; the holotype at GH is incorrectly cited by Weatherby (1935: 52) and Smith (1981*b*: 505) as 'Schipp 8–782' which is a common error for Schipp specimens prefixed by 'S-'. The correct citation is 'S-782' as amended by Smith (1995*b*: 189).

Thelypteris skinneri (Hook.) C.F. Reed in *Phytologia* **17**: 314 (1968)[110: 189]
Toledo, *W.A. Schipp* S-797 (GH[110, 115]).

Thelypteris struthiopteroides (C. Chr.) C.F. Reed in *Phytologia* **17**: 316 (1968)
Stann Creek, *W.A. Schipp* 926 (BRH[125]).
Not recorded for Belize in *Flora Mesoamericana* (Smith, 1995*b*: 178), though known from Oaxaca to Guatemala and tentatively included here on the basis of a record in Vargas & Shawe (1997: 48). Further investigation of the Schipp material at BRH or other duplicates is required to confirm the record.

Thelypteris tetragona (Sw.) Small, *Ferns s.e. states*: 256 (1938)[110: 189]
Cayo, *P.H. Gentle* 9021 (US[108, 110, 115]); Stann Creek, *R. Rivero* et al. 2530 (BRH[125]); Toledo, *G. Davidse* 35647 (MO[115]).

Thelypteris toganetra A.R. Sm. in *Amer. Fern J.* **63**: 118 (1973)[110: 190]
Toledo, B.D. Vanderveen 587 (UC[110, 115]).

VITTARIACEAE

Ananthacorus angustifolius (Sw.) Underw. & Maxon in *Contr. Gray Herb.* **10**: 487 (1908)[46: 148]
Cayo, *A. Hughes* 124 (BM!, BM-000557722![22]); Toledo, *T.B. Croat* 24380 (MO[46, 115]).
As *Vittaria costata* Kunze in *Flora Mesoamericana* (Moran, 1995*j*: 148), but treated here as a species of *Ananthacorus* following the recent revision by Crane (1997).

Anetium citrifolium (L.) Splitg. in *Tijdschr. Natuurl. Gesch. Physiol.* **7**: 395 (1840)[44: 145]
Toledo, *B.K. Holst* 5940 (MO[115]).

Hecistopteris pumila (Spreng.) J. Sm. in *London J. Bot.* **1**: 193 (1842)[45: 148]
Stann Creek, *W.A. Schipp* S-50 (US).

Polytaenium cajenense (Desv.) Benedict in *Bull. Torrey Bot. Club* **38**: 169 (1911)[45: 146]
As *Antrophyum cajenense* (Desv.) Spreng. in *Flora Mesoamericana* (Moran, 1995*i*: 146) and cited for Belize on the basis of an extralimital distribution record in *Flora of Chiapas* (Smith, 1981*a*: 33) though no supporting specimens are listed. The taxon is included here as a species of *Polytaenium* on the basis of the recent revision by Crane (1997: 516), though confirmation of the distribution from specimens is required.

Polytaenium feei (W. Schaffn. ex Fée) Maxon in *Sci. Surv. Porto Rico & Virgin Islands* **6**: 405 (1926)
Cayo, *C.L. Lundell* 6223 (MICH[28], US); Stann Creek, *W.A. Schipp* S-70 (US); Toledo, *P.H. Gentle* 5020 (MO[45, 115], US).
Treated as *Antrophyum lanceolatum* (L.) Kaulf. in *Flora Mesoamericana* (Moran, 1995*i*: 147), but included as a species of *Polytaenium* here on the basis of the recent revision by Crane (1997).

Polytaenium lineatum (Sw.) J. Sm. in *J. Bot. (Hooker)* **4**: 68 (1841)
Toledo, *G. Davidse* 36258 (MO[115]), *B.K. Holst* et al. 5402 (MO[115]).
This taxon was treated as a species of *Antrophyum* by Moran (1995*i*: 147) and not recorded from Belize, although it was listed for Chiapas and Guatemala. Stolze (1981: 442) gave the distribution as 'southern Mexico to Panama' in *Flora of Guatemala* but did not list supporting specimens, making this implicit reference difficult to interpret. It is included here on the basis of material collected in Toledo District in 1996 and identified in 1997 by A.R. Smith as *Polytaenium lanceolatum* (Sw.) Desv. The earlier name *P. lineatum* (Sw.) Sm. is used here following the revision of Vittariaceae by Crane (1997: 516).

Radiovittaria stipitata (Kunze) E.H. Crane in *Syst. Bot.* **22**: 515 (1997)
Toledo, *B.K. Holst* 4070 (MO[46, 91]), *B.K. Holst* et al. 5501 (MO[115]), *B.K. Holst* 5943 (MO[115]).
Listed for Belize in *Flora Mesoamericana* (Moran, 1995*j*: 150) as *Vittaria stipitata* Kunze, the genus *Radiovittaria* is adopted here following the revision of the Vittariaceae by Crane (1997: 515).

Scoliosorus ensiforme (Hook.) T. Moore, *Index fil.*: xxix (1857)[45: 147]
Toledo, F. Boutin & Schlosser 5116 (MO[45, 115]).
Treated as a species of *Antrophyum* in *Flora Mesoamericana* (Moran, 1995*i*: 147), but included in *Scoliosorus* here following the recent revision by Crane (1997).

Vittaria graminifolia Kaulf., *Enum. filic.*: 192 (1824)[46: 149]
Cayo, *T.B. Croat* 23767 (MO[46, 115]); Toledo, *B.K. Holst* 3876 (MO[91, 115]).

Vittaria lineata (L.) Sm. in *Mém. Acad. Roy. Sci. (Turin)* **5**(1790–1791): 421, t. 9, f. 5 (1793)[46: 149]
Cayo, *C.L. Lundell* 6493 (MICH[28]); Stann Creek, *W.A. Schipp* 152 (BM-000543175!, US); Toledo, *J.D. Dwyer* & R. Coomes 12992 (MO[46, 115]).

WOODSIACEAE

Athyrium filix-femina (L.) Roth, *Tent. fl. Germ.* **3**: 65 (1799)[64: 228]
Toledo, *sine leg.* 2 (US).
While there is a doubt concerning the exact provenance of the material listed here, *A. filix-femina* is recorded from Chiapas, Guatemala and El Salvador. Moran (1995*ac*: 228) did not cite a specimen but referred to *Flora of Guatemala* where Stolze (1981: 96) made explicit reference to 'British Honduras' under the synonym *A. dombei* Desv., but again without supporting material.

Diplazium cristatum (Desr.) Alston in *J. Bot.* **74**: 173 (1936)[1: 233]
Toledo, *P.H. Gentle* 7357 (BM-000543334![1, 115]).

Diplazium franconis Liebm.in *Kongel. Danske Vidensk. Selsk. Skr., Naturvidensk. Math. Afd.* ser. 5, **1**(1): 256 (1849)
Toledo, *G. Davidse & D.L. Holland* 36602 (MO[115]), *G. Davidse* 36869 (MO[115], UC).
Not recorded for Belize in the published version of *Flora Mesoamericana* (Adams, 1995*a*: 235) though listed for Chiapas, Guatemala and Honduras. It was included in the Internet version on the basis of material collected in 1997 (*Davidse & Holland* 36869, UC) and identified by A.R. Smith.

Diplazium grandifolium (Sw.) Sw. in *J. Bot. (Schrader)* **1800**(2): 62 (1801)[1: 236]
Toledo, *W.A. Schipp* S-783 (BR[1, 115], NY).

Diplazium neglectum (H. Karst.) C. Chr., *Index filic.*: 236 (1905)[1: 239]
Stann Creek, *W.A. Schipp* 535 (BM[1], BRH[125]).

Diplazium plantaginifolium (L.) Urb., *Symb. antill.* **4**: 31 (1903)[1: 241]
Cayo, *D.R. Hunt* 602 (BM); Stann Creek, *P.H. Gentle* 8205 (BM[1, 115]); Toledo, *B.K. Holst* et al. 5506 (MO[115]).

Diplazium riedelianum (Bong. ex Kuhn) Kuhn ex C. Chr., *Index filic.*: 230 (1905)[1: 241]

Toledo, *B.K. Holst* 4317 (MO[1, 91, 115]).

Diplazium striatum (L.) C. Presl, *Tent. pterid.*: 114 (1836)[1: 243]

Toledo, *B.K. Holst* 4473 (MO[1, 91, 115]).

Diplazium urticifolium H. Christ, *Prim. fl. Costaric.* **3**(1): 29 (1901)[1: 245]

Adams (1995*a*: 245) did not list a specimen from Belize, referring instead to *Flora of Guatemala* where Stolze (1981: 197) explicitly cited 'British Honduras' but without material. There may be supporting specimens at F.

Diplazium werckleanum H. Christ in *Bull. Herb. Boiss.* sér. 2, **4**: 969 (1904)[1: 246]

Toledo, F. Boutin & Schlosser 5052 (MO[1, 115]).

Hemidictyum marginatum (L.) C. Presl, *Tent. pterid.*: 111, t. 3, f. 24 (1836)

Standley & Record (1936: 63) included this taxon without a specimen reference. Stolze (1981: 271) gave the general distribution as 'southern Mexico to Panama' which may be taken as an implicit record for Belize, though without supporting specimens this is difficult to interpret. It was not listed for Belize in *Flora Mesoamericana* (Moran 1995*ac*: 246) though recorded from all surrounding countries. The only species of the genus widespread in the neotropics, *H. marginatum* is a robust plant unlikely to be misidentified as it is easily distinguished by the linear sori and venation which is anastomosed in the distal third. It is to be expected in Belize and there may be material seen by Standley at F.

DISCUSSION

To date, at least 319 species (using currently accepted taxonomy) of pteridophytes have been recorded for Belize. Put in context, Belize has almost half of the total of 652 species listed by Stolze (1983: 1) for the much larger and topographically diverse neighbouring country of Guatemala. Compared to the United States, Belize has half as many species again, yet the United States has approximately 400 times the land area. Despite its small size and lack of the high elevations found throughout much of Central America, Belize arguably has one of the richest pteridophyte floras in the world on an area basis.

Data presented in this paper include conventional sources, particularly herbaria and published literature, but also many digital sources (Web, CD-ROM, databases) for names, specimens, literature and related information. Development of the World Wide Web version of *Flora Mesoamericana* provides an unparalleled opportunity to assess the dynamic changes to a tropical flora. Increasingly information on species distribution becomes available on the Internet long before it appears in published literature and it may be available several years earlier. In order to resolve the complex and time-consuming task of searching the Internet, a web-enabled information system has been built by the senior author. This embodies design aspects of a conventional botanical database, a management information system, a metadatabase and web browser, to locate new records semi-autonomously and track changes in known records from Internet sources on a regular basis. Using all of the available published citations, Internet sources, determinations and herbarium records, an analysis of the growth of knowledge over time of the pteridophyte flora of Belize is shown in Fig. 2.

The graph covers records built up over nearly two centuries. During the nineteenth century there were very few relevant publications, so all data are presented as a single datum point on the graph to provide a starting point. Data for the twentieth century are summarized for each decade with an error bar to indicate annual variation within the decade. An expected shape for the graph would be a curve flattening out and approaching an asymptote as all species for the area were discovered. In contrast, a trend line shows that the rate of discovery of species is still continuing to rise steeply. The number of pteridophyte taxa recorded for Belize has risen by approximately 20% since the publication of the most recent volume of *Flora Mesoamericana*, demonstrating that the flora of this country has not been studied adequately. This percentage increase is similar to that for the flora taken as a whole, indicating that the deficiency is with collecting in general, rather than just pteridophytes.

A few of the new records listed here represent widespread, distinctive taxa and have been known for a long time from Belize, but appear in relatively obscure or overlooked literature. But most result from recent collections and it is apparent that the wetter areas of Belize, particularly towards the higher reaches of the Maya Divide in Toledo and Cayo (Fig. 1), are yielding most of the new records for the country. However, much of the Maya Divide is unexplored, particularly from the Cayo side. Some vegetation classes such as the *Liquidambar* forest of the higher elevations of the Maya Mountains and features such as the karst sinkholes in the Chiquibul Forest Reserve have had virtually no collecting. There has been a strong historical bias towards collections from southern Belize, particularly as the two most famous collectors of the Belizean flora, William A. Schipp and Percy H. Gentle, were based mainly in the south. Approximately 80% of the pteridophyte specimens examined come from the southern districts of Toledo, Stann Creek and Cayo and, of these, over half come from Toledo District. Very few pteridophytes have been collected from Corozal District. It is to be expected that a greater number of pteridophytes will be present on the more impervious shales and granite of the south than the limestone plateau of the north. The north-south gradient in rainfall undoubtedly exacerbates this effect, with almost three times as much rain falling in the far south as in the north of the country. However, it is clear that collecting in the more agriculturally developed north of the country has received far less effort and many more species are to be expected from this area, as well as from the floristically richer unexplored areas of the south.

There is also a temporal element to past collecting effort. An analysis by altitude and month reveals that very few collections have been made from upland areas during the wet season (especially June and July), presumably due to the difficult access. Collecting frequency is greatest in the dry season (mainly February to April), when many pteridophytes are sterile. Many species of pteridophytes widespread in Central America are currently missing from the list for Belize. While the country does not have the high elevations of most of its neighbours, it is evident that this list of native ferns and fern allies is far from complete and the total will increase substantially with focussed collecting.

Other taxa tentatively recorded for Belize in the literature and collections, but with insufficient information at present include: *Adiantum andicola* Liebm, *A. urophyllum* Hook., *Anemia phyllitidis* (L.) Sw., *Asplenium munchii* A.R. Sm., *A. radicans* L., *Diplazium lonchophyllum* Kunze, *Elaphoglossum setigerum* (Sodiro) Diels, *E. vestitum* (Schltdl. & Cham.) T. Moore, *Lomariopsis fendleri* D.C. Eaton, *L. sorbifolia* (L.) Fée, *Loxogramme mexicana* (Fée) C. Chr., *Polypodium murorum* Hook., *Tectaria trifoliata* (L.) Cav., *Thelypteris interrupta* (Willd.) K. Iwats., *T. parasitica* (L.) Tardieu, *T. scalaris* (H. Christ) Alston, and *T. serrata* (Cav.) Alston.

This paper is the first in a series arising from research on Belizean floristics, and updates will appear on The Natural History Museum web site (http://www.nhm.ac.uk/) as specimens, publications and citations are added. For the first time, the Belizean collections held at The Natural History Museum are being located in the herbaria and

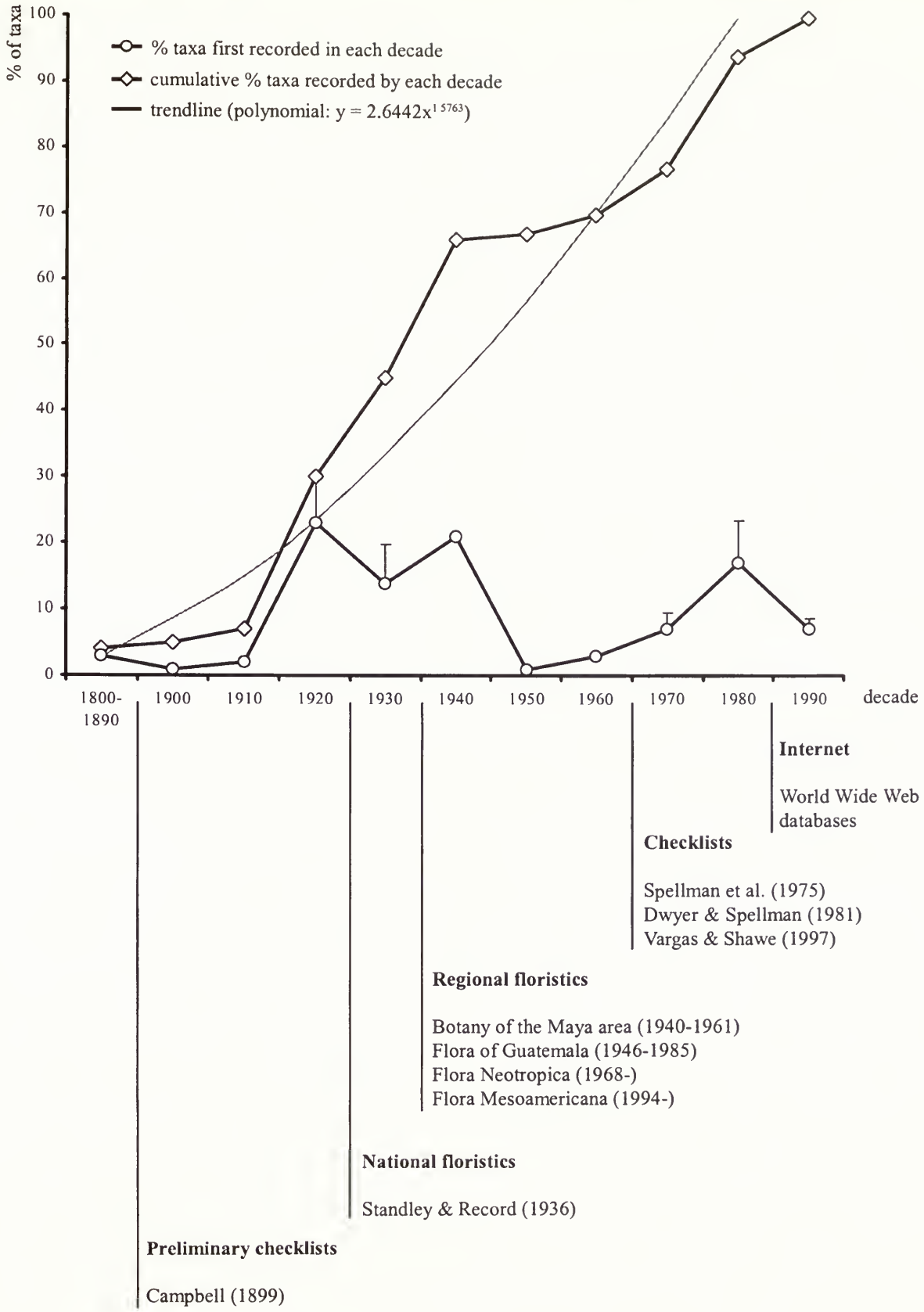

Fig. 2 Growth of knowledge of the pteridophyte flora of Belize.

documented. The project currently seeks to collate basic information for vascular plant taxa from Belize, supported by relevant specimens and literature, and some 8000 names, 7000 references and 32 000 specimens are in the database at the time of submission of the paper. It is estimated that minimal information on at least 45 000 specimens from Belize is comparatively readily available in the public domain, and that 75–100 000 specimens have been collected from the country. This material forms the basis for the cumulative knowledge on the flora of Belize, and provides a basis for further research.

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Collections of flowering plants by Francis Buchanan-Hamilton from Nepal, 1802–1803

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CONTENTS

SYNOPSIS. The herbarium of Francis Hamilton (formerly Buchanan) is one of the most important historical collections relating to the flora of Nepal. Containing the earliest plant collections from that country, and made by one of the most accomplished botanists in the Indian Subcontinent at that time, it has considerable intrinsic interest and value. Moreover, along with Wallich material, Hamilton's collections formed the basis for Don's *Prodromus florae nepalensis* (1825) in which many new species were described: thus they include numerous types. Only two extensive sets exist, the top set at the Linnean Society of London and the second set, the basis of Don's work, at The Natural History Museum. Small numbers of Hamilton's Nepalese sheets also occur elsewhere, e.g. at Kew, Edinburgh and Liverpool. This paper enumerates Hamilton's flowering plant collections from Central Nepal, as well as providing some background to, and an explanation of, the name changes undergone by the man himself.

INTRODUCTION

The man variously referred to as Buchanan, Hamilton or Buchanan-Hamilton was born in 1762 at Branziet (on the Bardowie estate, near Glasgow) in Scotland and christened simply Francis Buchanan. The causes of the confusion surrounding his name, and the correct citation of it are explained later in this paper; but for the sake of simplicity he is referred to throughout the text as Buchanan, the name he bore for the greater part of his life. His life and career are covered in detail by Prain (1905) and in admirable précis by Mabberley (1977). Only a very brief outline is given here to provide some necessary background and to explain in more detail events involving his Nepalese collections.

Buchanan was a physician who already had made two, possibly three, voyages to the East Indies before joining the Honourable East India Company as an Assistant Surgeon on the Bengal Establishment based at Calcutta. This marked the beginning of an 18-year period in the Indian Subcontinent and surrounding regions during which he visited much of India as well as Burma, the Andaman Islands, areas such as East Bengal and Chittagong now in Bangladesh and Nepal (Table 1). Despite his position as a medical officer, Buchanan was highly regarded as a collector and natural historian. He was an astute observer of all aspects of the region and had already undertaken several official economic surveys before embarking on his first attempt to visit the Kingdom of Nepal in 1800. This embassy was aborted but a year later he left Calcutta on a second attempt to visit Nepal, travelling via Saran and Tirhoot and collecting *en route*. By late January of 1802 he had reached the Indian village of Dacca on the Nepalese border, but after several weeks had only progressed some two miles into Nepal. The expedition had to return to Indian territory for a brief period, probably for diplomatic reasons, but by April was once again in Nepal and travelling towards Kathmandu. On first entering Nepal, Buchanan had remarked (in a letter to his friend and mentor William Roxburgh) that the 'pestilential season is fast approaching'. Once in Kathmandu, he found himself with many professional (i.e. medical) duties, contributing no doubt to his opinion of 'the country being most unhealthy' and one which he wished to leave as soon as possible.

Notwithstanding his initial opinion, Buchanan spent 14 months in and around Kathmandu recording information on all forms of natural resources, manufacturing, climate and the people themselves, as well as sending seeds and living plants to the Botanic Garden in Calcutta. In addition to all of these, Buchanan made a large collection of dried plant specimens accompanied by many drawings (by Indian artists) and plant descriptions. Much of the information was obtained by his companion and employee Babu Ramajai Bhattacharji, a Brahmin from Calcutta who accompanied Buchanan on this and other expeditions. In March 1803 the expedition left Kathmandu to return to to Calcutta.

In 1805 Buchanan returned to England on leave. While in London he gave to his friend J.E. Smith his large collection of drawings and manuscripts relating to Indian plants, which included a large number collected on the survey of Mysore (S. India) in 1800–1801 along with his entire collection of specimens from Nepal. According to Smith the whole collection represented some 1500 species but it is more likely to have been 1500 specimens.

Buchanan's time in the Kathmandu valley was his only visit in Nepal but he was able to augment his knowledge and collections on two further occsions. By 1807 he had returned to Calcutta as Surveyor for the Honourable East India Company charged with detailing the climate, topography, agriculture, natural resources, trade, culture, politics and religion of the Bengal Presidency and those adjacent countries and minor states with which the Company had no regular contact. With regard to areas outside the Company's possessions, information had to be obtained indirectly, as Buchanan himself was specifically barred from entering them. This did not prevent him, when based at Nathpur near the Nepalese border during the rainy season of 1810, from dispatching local collectors across the border into Eastern Nepal to bring back specimens.

In 1814, he was again near the Nepalese border, this time at Gorakhpur, when further data on Nepal was gathered. Presumably such information was obtained by questioning natives of the country or other subjects of the East India Company who had travelled or stayed in Nepal, as required by Buchanan's instructions from the Company's Court of Directors. Again, local collectors were employed to bring back collections.

Shortly after this Buchanan's health began to decline and after a very brief tenure as Superintendant of the Calcutta Botanic Garden he prepared to return to England and eventual retirement in his native Scotland. Here he continued to arrange his papers and prepare material for publication but was hampered by lack of access to his collections which, as the property of the East India Company, remained in London. Indeed, he clearly felt that as well as failing to appreciate his own efforts on their behalf, the Company was cheating the scientific world by withholding his collections from wider study, and in a letter dated 14 February 1817 to his successor in Calcutta, Nathanial Wallich, warned against finding himself [Wallich] in a similar situation 'The Court of Directors [of the East India Company] has indeed received my collection with such contempt and arrogance that I would neither ask nor receive any favour. . . My collection would have been received with the utmost thankfulness by the most learned bodies here and might have gratified several of the most distinguished. Do not therefore throw any of your pearls before swine but collect largely and keep your collections for the learned of your own country [Wallich was Danish], who I have no doubt will be thankful'.

Despite any difficulties caused by lack of access to his collections, Buchanan prepared for publication an account of Nepal (Hamilton, 1819) and in 1819 he was able to obtain from the East India Company a duplicate set of his 1807–1814 botanical collections which he immediately began to catalogue. However, the Nepal material was not among them, having been given to J.E. (now Sir James) Smith in 1805, in whose collection they remained little regarded. In another letter to Wallich dated 16 October 1821, Buchanan wrote 'I . . . rejoice at your good luck in having access to the treasures of Nepal. A great part of what I have done there has been in a sort lost as having been given to Sir J.E. Smith who is rather indolent and not likely to publish any considerable part of what he has. A Mr. Don, however, who lives with Mr Lambert, to whom I gave duplicates of the collection presented to Sir J.E. Smith, is engaged in publishing an account of them together with those which you have sent, and I believe has both abilities and industry to produce a very valuable work. Whether or not Sir J.E. Smith will allow him the use of my drawings and written descriptions I have not learned. Your offer of joining me in a work on Nepal is very flattering, but I have no intention of taking upon myself such a labour; indeed I have not a single note respecting any of the plants I brought with me from Nepal-Smith has the whole.' While Buchanan never published any work based on his Nepal collections, Don did complete and publish his account.

On the death of his eldest brother in 1818 Buchanan succeeded to the family properties, part of which comprised his mother's estate of Bardowie. In order to benefit from this portion of his inheritance and comply with the legalities attached to it, he was required to adopt his mother's family name of Hamilton. It was as Francis Hamilton that he died in 1829 at the age of 67.

CORRECT CITATION OF HAMILTON (FORMERLY BUCHANAN)

The problem of how to refer to a man who began his life under one name and ended it under another has attracted different solutions. In a document submitted to support his (successful) claim to be the chief of the Buchanans of Buchanan, he styled himself Francis Hamilton Buchanan, an appellation followed by many authors referring to his zoological works. Other documents name him as Buchanan Hamilton, the name used by many botanical authors. Prain (1905) stated that the correct citation was simply Hamilton and condemmed zoologists for their 'erroneous and unnecessary practice' of using both names and botanists for following suit but in reverse! Of the more modern reference works, Stafleu & Cowan (1979) use the form Francis Hamilton (né Buchanan) with the abbreviation *F. Ham.* while Brummitt & Powell (1992) prefer the name Buchanan-Hamilton with the abbreviation *Buch.-Ham.* Thus, as an author in literature he is Hamilton, but as an authority in plant names he is Buchanan-Hamilton. There appears no definitive usage, but for botanical works at least it seems best to refer to Buchanan-Hamilton as the name least likely to cause further confusion.

BUCHANAN-HAMILTON'S COLLECTIONS

As already explained, Buchanan's Central Nepalese material collected during 1802–1803 and including the associated drawings and manuscripts, were given by him to J.E. Smith. Smith described 33 species based on these collections in Rees' *Cyclopaedia* (1802–1820) and 12 others in his own *Exotic Botany* (1804–1805) but otherwise made little or no use of them. The entire collection of 433 specimens collected in Nepal (Hara et al., 1978) remained in his herbarium, eventually passing to the Linnean Society in 1829. Duplicates distributed from Smith's herbarium may include small numbers of Buchanan sheets. For example, 14 Buchanan specimens of flowering plants and three specimens of bryophytes are held at Liverpool Museum (LIV) (Sedgwick, *pers. com.*).

Buchanan gave a duplicate set, as complete as he could achieve, to his contemporary A.B. Lambert, a British botanist living in London. In turn, Lambert made the material available to his assistant David Don who began studying it in 1820. This material, together with specimens from Nepal collected and sent to Lambert by Wallich, together amounted to some 2000 specimens (Miller, 1970) and formed the basis for Don's *Prodromus florae nepalensis* (1825) which contained descriptions of many new species. For reasons

Table 1 Some significant dates in the life of Buchanan-Hamilton.

15 February 1762	Born Branziet, Stirlingshire. Fourth son of Thomas Buchanan of Spittal and Elizabeth Hamilton of Bardowie.
1779?-1783	Studied medicine at Edinburgh University. J.E. Smith who later founded the Linnean Society was a contemporary and friend.
1785	First voyage to Bombay via Cape and Comoros.
1788?-1789	Second voyage to Philippines and Moluccas.
1791-??	Possible third voyage, to East Indies (not confirmed).
26 September 1794	Appointed Assistant Surgeon for Honourable East India Company on Bengal Establishment.
1795	Visit to Rangoon, the Andamans, Pegu and Ava. Plants collected and drawn during this period were described and published by Sir Joseph Banks.
1796-1798	Posted to SE Bengal. Excursions to the Eastern Sundribuns.
1798	Undertook three-month economic survey of Chittagong.
1798-1800	Several trips to the Western Sundribuns: descriptions and drawings but no collections of plants. Mainly worked on Gangetic fishes.
1800	Nepal. Start date of expedition unknown but by February Buchanan was waiting to cross the Indian/Nepalese border. He did not enter Nepal on this occasion.
1800	Survey of the Raj of Mysore and parts of Malabar.
1802	Second attempt to reach Nepal. First entered the country on 2 March 1802.
1803	Expedition leaves Kathmandu on 18 March 1803, reaching Segouli on 28 March 1803.
1805	Returned to England. Entire collection of Nepal plants given to J.E. Smith.
1806	Returned to India and in 1807 begins the most detailed survey of India ever made.
1810	Near the Pernea/Nepal border during the rainy season, at Nathpur.
1811	Buchanan's health begins to decline, especially during the period 1813-14.
1814	Near the Nepalese border, this time at Gorakhpur.
1814	Returned to Calcutta.
1814	Appointed Superintendant of the Calcutta Botanic Garden as successor to Roxburgh and Colebrooke.
1815	Left for England aboard the *Marchioness of Ely* on 23 March 1815. The care of the Calcutta Botanic Garden passed to Nathanial Wallich.
1815	Returns in August to England and shortly afterwards to his native Scotland.
1818	Succeeds to the family properties on death of his elder brother on 10 January 1818; by April has adopted his mother's name of Hamilton.
1819	Prepared for publication an account of Nepal. In this year he also visited London and was able to obtain from the East India Company his botanical collections.
1829	Died on 15 June 1829 at Leny, in Scotland, aged 67.

which remain unknown, Don was apparently unable to consult either the full set in Smith's herbarium or Buchanan's manuscript descriptions, also in Smith's possession. The type specimens thus probably belong to Lambert's set, with those in Smith's herbarium at the Linnean Society presumably representing isotypes.

On Lambert's death his herbarium was divided into lots and sold at auction. Lot 286, described in the sale catalogue as containing a large collection of about 500 species of plants from Nepal, Mysore and Malabar made by Hamilton was purchased by Robert Brown for the British Museum and incorporated into the herbarium there. According to annotations by James Britten in The Natural History Museum's copy of Don's *Prodromus florae nepalensis* at least 332 sheets of flowering plants (together with 31 sheets of pteridophytes) in Lot 286 were collected in Central Nepal in 1802–1803. These are only a part of the material available to Don in Lambert's herbarium and not all of the Buchanan-Hamilton specimens cited in Don's *Prodromus* have found their way into the collections at The Natural History Museum. Only 285 of the original 332 **BM** specimens have been traced. In such a large herbarium it is quite possible that a number have been refiled (possibly under new names) and remain to be found. The task of recognizing Buchanan-Hamilton specimens is made harder by the fact that a number were remounted and the original labels (if present) were not retained in some cases. One hundred and ninety-two Buchanan-Hamilton Nepalese sheets are kept in the Smith herbarium at the Linnean Society.

While working on his *Prodromus*, Don apparently sent duplicates from Lambert's set of Buchanan's 1802–03 specimens to various colleagues. They include Proctor, von Martius and de Jussieu; these sheets are now held in Oxford (**OXF**), Meise (**BR**) and Paris (**P-JU**) respectively.

Although Buchanan stated on several occasions that the whole of his early Nepal collections were presented to Smith, the duplicate set provided to Lambert indicates that Smith did not receive every specimen. It is possible that the gift to Lambert also did not exhaust the material and that at least some further specimens remained in the East India Company herbarium. If so, these would have been disposed of in the same way as Buchanan's later collections.

Buchanan's small 1810 and 1813–14 collections from Eastern Nepal formed part of the East India Company's herbarium and were distributed along with this material by Wallich. Thus, Buchanan specimens from these periods may be held in several institutes. The greatest number appears to be in the Wallich Herbarium at Kew (**K-W**) with a smaller number in Edinburgh (**E**). Specimens from this period are not dealt with in this paper.

THE CATALOGUE

The Catalogue which follows covers only those flowering plant specimens collected by Buchanan-Hamilton in Central Nepal during the period 1802–1803 and housed in the herbaria at The Natural History Museum (**BM**), the Smith herbarium at the Linnean Society (**LINN-SM**) and Liverpool (**LIV**).

Choosing the most useful arrangement for the entries posed problems. We feel that the most likely starting point for users will be either literature citing a Buchanan-Hamilton specimen or information taken from the specimen itself. Therefore the entries are arranged alphabetically by family, genus and species in descending order by the name under which the specimen was first cited in published literature. Two families, Amaryllidaceae and Liliaceae, are used in their broad sense with genera assigned accordingly. This is done to keep the arrangement in line with that used in *An enumeration of the flowering plants of Nepal* (Hara, Stearn & Williams, 1978; Hara & Williams, 1979; Hara, Chater & Williams, 1982), up to now the

standard reference for Nepalese plants. The names of the segregated families to which these genera are now commonly assigned are indicated as appropriate. As Buchanan's collections are so closely associated with D. Don's *Prodromus florae nepalensis* (1825), this work is also cited when relevant. Where a specimen has not been cited in literature, the Buchanan-Hamilton name on the sheet is used. Accepted names are shown in bold and synonyms in italics. Where the name is a synonym the currently accepted name is provided. The latter are mostly taken from *Annotated checklist of the flowering plants of Nepal* (Press et al., 2000), an updated version of the earlier *An enumeration of the flowering plants of Nepal* (Hara et al. 1978, 1979, 1982). Various names not found in either of these works have been provided by Dr Henry Noltie (*pers. com.*). The authors have been unable to examine the material in the Smith herbarium as this is currently undergoing conservation treatment at the National Museums and Galleries on Merseyside, Liverpool. A large proportion of these specimens lack an accepted name, an omission which we hope will be rectified by appropriate experts when the material is, once again, accessible. Buchanan-Hamilton manuscript names taken up by other authors are not repeated in the entries. Otherwise, each entry includes any additional Buchanan-Hamilton manuscript names (using Buchanan-Hamilton's spellings), together with the locality and collection date as provided by the label on the specimen. Where these are not known, the relevant data from the literature citation is given in quotation marks. The herbarium where the specimen is held is also shown; where material has not been located by us in any of the herbaria examined, this is indicated by the comment 'Specimen not found'. These include specimens which may have been seen at The Natural History Museum (**BM**) by authors of accounts for *An enumeration of the flowering plants of Nepal* (Hara et al. 1978, 1979, 1982) but which we have been unable to locate. A number of specimens from The Natural History Museum are known or presumed to be among material on loan at the time of this study. Information from specimens on loan to Edinburgh has kindly been provided by Dr Noltie (*pers. com.*): such specimens are annotated as **BM** but without an exclamation mark as they have not been seen by the authors. The remainder are indicated by the comment 'Material on loan: not seen'. An explanatory note may be appended to an entry.

Many of the specimens represent type material, particularly for Don names. The situation here is complicated by Don's propensity for coining superfluous names for taxa already validly published elsewhere and often cited as synonyms of his new name. While it seems that Don studied the specimens now held in **BM**, those in other herbaria may also be original elements. We are very aware of the risks of inadvertently lectotypifying specimens by careless use of terms. We have, therefore, chosen to refer to original material throughout as 'syntypes', even when is it clear that only a single specimen is being referred to. It is not our intention to publish any novel typifications here and no statements in this publication should be interpreted as effecting typification for any name. We feel it is more appropriate for authors engaged in more detailed taxonomic studies of particular groups to make any necessary lectotypifications.

ACANTHACEAE

Barleria cristata L., D. Don, *Prodr. fl. nepal.*: 119 (1825).
Narainhetty, 26 August 1803 (BM!).

The date on the specimen is incorrect, Buchanan having left Nepal in March 1803. In all probability it should read 26 August 1802.

Lepidagathis incurva [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 119 (1825).
Ruellia recurva Buch.-Ham., in sched.
Narainhetty, 27 January 1803 (BM!-syntype).

Ruellia capitata [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 120 (1825).
'ad Narainhetty Nepalensium. Floret Octobri' (BM?-syntype). Material on loan: not seen.
= **Strobilanthes pentastemonoides** (Nees) T. Anderson

ACERACEAE

Acer laurifolium D. Don, *Prodr. fl. nepal.*: 249 (1825), nom. superfl.
Acer buzimpala Buch.-Ham., in sched.
Narainhetty, 24 February 1802 (BM!).
= **Acer oblongum** Wall. ex DC.

ALISMATACEAE

Sagittaria lappula D. Don, *Prodr. fl. nepal.*: 22 (1825).
Alisma lappula Buch.-Ham., in sched.
'in Nepaliâ' [No original label]. (BM!-syntype).
= **Sagittaria guyanensis** subsp. **lappula** (D. Don) Bogin

AMARYLLIDACEAE s.l.

Narcissus tazetta L., Buch.-Ham., in sched.
Narainhetty, 22 September 1802 (Sheet 573.11 LINN-SM, microfiche!).

(ALLIACEAE)
Allium sulvia [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 53 (1825).
Suembu, 11 July 1802 (Sheet 583.38 LINN-SM, microfiche!-syntype).
= **Allium tuberosum** Rottler ex Spreng.

ANACARDIACEAE

Dobinea vulgaris [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 249 (1825).
Narainhetty, 15 September 1802 (BM!-syntype?).

Although the locality matches that given in the protologue, the collection date is September while Don gives the flowering time as August, suggesting that he saw a different specimen.

APOCYNACEAE

Alstonia lucida D. Don, *Prodr. fl. nepal.*: 131 (1825).
Echites triangularis Buch.-Ham., in sched.
Sembu, 18 May 1802 (BM!-syntype; Sheet 444.18 LINN-SM-syntype, microfiche!).
= **Trachelospermum lucidum** (D. Don) K. Schum.

Echites fragrans Buch.-Ham., in sched.
Suembu, 5 May 1802 (Sheet 444.20 LINN-SM, microfiche!).
= **Chonemorpha fragrans** (Moon) Alston

Echites tomentosa Buch.-Ham., in sched.
Sembu, 7 July 1802 (Sheet 444.19 LINN-SM, microfiche!).

Nerium niveum Buch.-Ham., in sched.
Norcotera, 26 March 1802 (LINN microfiche!).
= **Vallaris solanacea** (Roth) O. Kuntze

AQUIFOLIACEAE

Ilex dipyrena Wall., D. Don, *Prodr. fl. nepal.*: 188 (1825).
'in Nepalia' [No original label]. (BM!).

Ilex odorata [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 189 (1825).
Chitlong, 12 April 1802 (BM!-syntype).

Ilex rotunda sensu D. Don, *Prodr. fl. nepal.*: 189 (1825), non Thunb. (1784).
Ilex saysia Buch.-Ham., in sched.
Suemby, 9 May 1802 (BM!).
= **Ilex excelsa** (Wall.) Hook.f.

ARALIACEAE

Hedera aculeata [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 187 (1825).
'in Nepaliâ ad Narainhetty. Floret Octobri' (BM?-syntype). Material on loan: not seen.
= **Brassaiopsis aculeata** (D. Don) Seem.

Hedera elata [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 187 (1825).
Narainhetty, 13 November 1802 (BM!-syntype).
= **Schefflera elata** (D. Don) Harms

Hedera hainla [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 187 (1825).
'ad Narainhetty Nepaliae. Floret Februario' (BM?-syntype). Material on loan: not seen.
= **Brassaiopsis hainla** (D. Don) Seem.

Hedera helix sensu D. Don, *Prodr. fl. nepal.*: 187 (1825), non L. (1751).
Narainhetty, 16 September 1802 (BM!).
= **Hedera nepalensis** K. Koch

Hedera parasitica [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 188 (1825).
Aralia parasitica Buch.-Ham., in sched.
'in Nepaliâ ad Narainhetty. Floret Novembri' (BM?-syntype). Material on loan: not seen.
= **Pentapanax parasiticus** (D. Don) Seem.

Hedera tomentosa [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 187 (1825), non *Schefflera tomentosa* (Seem.) Harms (1894).
'in Nepaliâ' [No original label] (BM!-syntype).
= **Schefflera impressa** (C.B. Clarke) Harms

ASCLEPIADACEAE

Ceropegia candelabrum L., Buch.-Ham., in sched.
Narainhetty, 13 August 1802 (Sheet 405.2 LINN-SM, microfiche!).

Cyananchus foetidum Buch.-Ham., in sched.
Bassaria, 12 March 1802 (Sheet 454.17 LINN-SM, microfiche!).

BALSAMINACEAE

Impatiens odorata D. Don, *Prodr. fl. nepal.*: 203 (1825), nom. superfl.
Balsamina odorata Buch.-Ham., in sched.
'in Nepaliae ruderatis ad Narainhetty. Floret Septembri' (BM?). Material on loan: not seen.
= **Impatiens leptoceras** DC.

Impatiens racemosa D. Don, *Prodr. fl. nepal.*: 203 (1825), non DC. (1824), nom. superfl.
Balsamina racemosa Buch.-Ham., in sched.
'in ruderatis apricis Nepaliae ad Narainhetty. Floret Augusto' (BM?). Material on loan: not seen.
= **Impatiens insignis** DC.

BEGONIACEAE

Begonia dioica [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 223 (1825).
'ad Narainhetty Nepaliae. Floret Augusto'. (Syntype: specimen not found).

Begonia hatacoa [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 223 (1825).
Sembu, 8 July 1802 (BM!-syntype).

Begonia picta Sm., *Exot. bot.* **2**: 81, t. 101 (1805).
Sembu, 21 July 1802 (BM!-syntype).
The specimen is cited as holotype by Z. Badcock in sched. (1998).

Begonia rubella [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 223 (1825).
Narainhetty, 10 September 1802 (BM!-syntype).

BERBERIDACEAE

Berberis aristata DC., *Syst. nat.* **2**: 8 (1821).
Berberis chitria Buch.-Ham., in sched.
'in Napauliâ'. (Syntype: specimen not found).
The specimen appears also to be the basis for *Berberis chitria* Lindl. (see below).

Berberis chitria [Buch.-Ham. ex] Lindl. in *Bot. Reg.* **9**, t. 729 (1823).
Berberis paniculata Buch.-Ham., in sched.
'Nepal'. (Syntype?: specimen not found).
Chitlong, Upper Napaul, 10 April 1802 (Sheet 622.7 LINN-SM, microfiche!).
Lindley coined this name in preference to *B. aristata* DC. and states that it is based on 'samples in the Lambertian Herbarium, collected by Dr. Hamilton in Nepal'. The names *B. aristata* and *B. chitria* are therefore based on the same type material. However, both taxa are currently accepted species.
The sheet is annotated by C.K. Schneider 'Differt a *B. aristata* DC., inflores. compositis et a *B. Chitria* ramis grinis angularis glabris. Sp. nov. videter.'

Mahonia napaulensis DC., *Syst. nat.* **2**: 21 (1821).
Berberis miccia [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 205 (1825), nom. superfl.
Berberis pinnata Buch.-Ham., in sched.; *Berberis miccia* Buch.-Ham., in sched.
Narainhetty, 15 November 1802 (BM!).
Berberis miccia Buch.-Ham., in sched; *Leontia fruticosa* Buch.-Ham., in sched.
Chitlong, 10 May 1802 (Sheet 622.10.1 LINN-SM, microfiche!).
Narainhetty, 23 December 1802 (Sheet 622.9 LINN-SM, microfiche!-syntype).
DeCandolle cites both Buchanan and Roxburgh sheets in Herb. Lambert with the locality given as Harain-Netty and flowering in December. No material dated December has been located at BM.

BETULACEAE

Alnus nepalensis D. Don, *Prodr. fl. nepal.*: 58 (1825).
Betula boshia Buch.-Ham., in sched.
Narainhetty, 25 October 1802 (BM!-syntype).

Betula alnoides [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 58 (1825).
'in sylvis ad Narainhetty Nepaliae superioris. Floret Octobri'. (Syntype: specimen not found).

BORAGINACEAE

Cynoglossum prostratum [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 100 (1825).
'ad Baguanpur. Floret Martio'. (Syntype: specimen not found).
= **Bothriospermum zeylanicum** (J. Jacq.) Druce

Heliotropium obovatum [Roxb. ex] D. Don, *Prodr. fl. nepal.*: 101 (1825).
'versus ripas fluminis infra Morshidabad. Floret Aprili'. (Syntype: specimen not found).
= **Heliotropium ovalifolium** Forssk.
Although included by Don this specimen is not from Nepal but was collected in India.

BURMANNIACEAE

Burmannia disticha L., Buch.-Ham., in sched.
Narainhetty, 15 August 1802 (Sheet 565.2.2 LINN-SM, microfiche!).

BUTOMACEAE

Butomus latifolius D. Don, *Prodr. fl. nepal.*: 22 (1825).
'in Nepaliâ'. (Syntype: specimen not found).
= **Butomopsis latifolia** (D. Don) Kunth

CAMPANULACEAE

Lobelia begonifolia Wall., D. Don, *Prodr. fl. nepal.*: 158 (1825).
Lobelia obliqua Buch.-Ham., in sched.
Sembu, 5 June 1802 (BM!).
= **Pratia nummularia** (Lam.) A. Braun & Asch.

Lobelia pyramidalis Wall., D. Don, *Prodr. fl. nepal.*: 157 (1825).
Lobelia stimulans Buch.-Ham., in sched.
'in Nepaliae montosis ad Narainhetty. Floret Februario'. (Specimen not found).

Lobelia secundei? Buch.-Ham., in sched.
Narainhetty, 17 February 1803 (BM!)
= **Lobelia rosea** Wall.

Lobelia trialata [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 157 (1825), nom. superfl.
'in Nepaliâ' [No original label]. (BM!).
= **Lobelia heyneana** Roem. & Schult.

CAPRIFOLIACEAE

Caprifolium macranthum D. Don, *Prodr. fl. nepal.*: 140 (1825).
Xylosteum scandens Buch.-Ham., in sched.
Sembu, 2 June 1802 (BM!).
= **Lonicera macrantha** (D. Don) Spreng.

Viburnum cylindricum [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 142 (1825).
Narainhetty, 10 August 1802 (BM!-syntype).

Viburnum mullaha [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 141 (1825).
Viburnum lantana? Buch.-Ham., in sched.
Sembu, 11 July 1802 (BM!-syntype).

Viburnum punctatum [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 142 (1825).
Suembu, 28 April 1802 (BM!-syntype).

Xylosteum ligustrinum (Wall.) D. Don, *Prodr. fl. nepal.*: 140 (1825), nom. superfl.
Xylosteon naisoca Buch.-Ham., in sched.
Chitlong, 11 April 1802 (BM!).
= **Lonicera ligustrina** Wall.

CARYOPHYLLACEAE

Arenaria serpyllifolia L., D. Don, *Prodr. fl. nepal.*: 215 (1825).
Narainhetty, 1 January 1802 (BM!).

Cerastium grandiflorum [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 216 (1825).
Narainhetty, 11 March 1803 (BM!-syntype).
= **Cerastium fontanum** subsp. **grandiflorum** (D. Don) H. Hara

Stellaria monosperma [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 215 (1825).
Stellaria saccurcunda Buch.-Ham., in sched.
Narainhetty, 16 October 1802 (BM!-syntype).
Cited as lectotype by Hara in *Enum. fl. pl. Nepal* **2**: 58 (1979).

Stellaria saxatilis [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 215 (1825).
Bimpedi, 8 April 1802 (BM!-syntype).
= **Stellaria vestita** Kurz

CELASTRACEAE

Euonymus lacerus [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 191 (1825).
Euonymus madana Buch.-Ham., in sched.
Suembu, 5 May 1802 (BM!-syntype).
= **Euonymus grandiflorus** Wall.

COMBRETACEAE

Combretum? appendiculatum Buch.-Ham., in sched.
Hettaura, 24 March 1803 (Sheet 658.14 LINN-SM, microfiche!); Hettaurei (Sheet 658.15 LINN-SM, microfiche!).

Combretum nanum [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 219 (1825).
Bassaria, 4 March 1802 (BM!-syntype); Bassaria, 9 March 1802 (Sheet 586.16.2 LINN-SM, microfiche!-syntype); Terriany forest, 30 March 1802 (Sheet 586.16.1 LINN-SM, microfiche!-syntype).

Combretum spicatum Buch.-Ham., in sched.
Suembu, 17 May 1802 (Sheet 658.17 LINN-SM, microfiche!).

COMMELINACEAE

Aneilema hispida D. Don, *Prodr. fl. nepal.*: 45 (1825).
Commelina hispida Buch.-Ham., in sched.
Narainhetty, 22 September 1802 (BM!-syntype).
= **Floscopa scandens** Lour.

Commelina obliqua [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 45 (1825), non Vahl (1806).
'in Nepaliâ.' (Syntype: specimen not found).
= **Commelina paludosa** Blume

COMPOSITAE

Antennaria contorta D. Don in *Bot. Reg.* **7**: t. 605 (1821).
Gnaphalium contortum Buch.-Ham., in sched.
Narainhetty, 14 October 1802 (BM!).
= Anaphalis contorta (**D. Don**) **Hook.f.**
Don states that 'The species was originally observed by Dr. Hamilton (then Buchanan) near the town of Narainhetty in Nepal, and samples collected in the native spot are preserved in Mr. Lambert's Herbarium'. However, the species was described from material grown at Spofforth in England. The original source was probably Buchanan-Hamilton, according to Don via the Calcutta Botanic Garden.

Antennaria timmua D. Don, *Prodr. fl. nepal.*: 174 (1825).
Gnaphalium timmua Buch.-Ham., in sched.
'in Nepaliâ'. No original label (BM!-syntype).
= **Anaphalis margaritacea** (L.) Benth.

Antennaria triplinervis Sims in *Bot. Mag.* **51**: t. 2468 (1824).
Gnaphalium quintuplinerve Buch.-Ham., in sched.
Narainhetty, 30 August 1802 (BM!).
= **Anaphalis triplinervis** (Sims) C.B. Clarke

Artemisia parviflora [Roxb. ex] D. Don, *Prodr. fl. nepal.*: 181 (1825).
Artemisia parviflora Buch.-Ham., in sched.; *Artemisia chinense* L.?, Buch.-Ham., in sched.
Narainhetty, 15 September 1802 (BM!-syntype?).
= **Artemisia japonica** Thunb.
Roxburgh, *Hort. bengal.*: 61 (1814) also cites a Buchanan specimen from Nepal, but without date or locality.

Aster trinervius [Roxb. ex] D. Don, *Prodr. fl. nepal.*: 177 (1825).
Aster asper [Buch.-Ham. ex] DC., *Prodr.* **5**: 277 (1836), nom. superfl.
Narainhetty, 23 October 1802 (BM!-syntype).
Roxburgh, *Hort. bengal.*: 61 (1814) also cites a Buchanan specimen from Nepal, 1802 but without further details.

Cacalia cusimbua D. Don, *Prodr. fl. nepal.*: 179 (1825).
Cacalia cusimbium Buch.-Ham., in sched.
'in Nepaliâ.' (Syntype: specimen not found).
= **Gynura bicolor** (Willd.) DC.

Chaptalia maxima D. Don, *Prodr. fl. nepal.*: 166 (1825).
Perdicium semiflosculare? Buch.-Ham., in sched.
Narainhetty, 17 November 1802 (BM-syntype).
= **Gerbera maxima** (D. Don) Beauverd

Cnicus verutus D. Don, *Prodr. fl. nepal.*: 167 (1825).
Carduus trilobus Buch.-Ham., in sched.
Narainhetty, 11 March 1803 (BM-syntype).
= **Cirsium verutum** (D. Don) Spreng.

Conyza cappa [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 176 (1825).
Conyza? cappa Buch.-Ham., in sched.
Suembu, 7 July 1802 (BM-syntype).
= **Duhaldea cappa** (D. Don) Anderberg

Erigeron alatum [Roxb. ex] D. Don, *Prodr. fl. nepal.*: 171 (1825).
Conyza alata Buch.-Ham., in sched.
Narainhetty, 18 October 1802 (BM!-syntype?).
= **Laggera alata** (D. Don) Sch. Bip. ex Oliv.
Roxburgh, *Hort. bengal.*: 61 (1814), cites a Buchanan specimen from Nepal but without date or locality.

Erigeron falcatum D. Don, *Prodr. fl. nepal.*: 172 (1825).
Conyza falcata Buch.-Ham., in sched.
'ad Bassaria Nepalensium. Floret Februario'. (Syntype: specimen not found).
= **Blumeopsis falcata** (D. Don) Merrill
This specimen is also the syntype of *Conyza falcata* [Buch.-Ham. ex] Spreng., *Sys. veg.* **2**, 513 (1825).

Erigeron leucanthum D. Don, *Prodr. fl. nepal.*: 171 (1825).
Conyza leucanthemea Buch.-Ham., in sched.
Bassaria, 1 March 1802 (BM-syntype).
= **Conyza leucantha** (D. Don) Ludlow & P.H. Raven

Erigeron pinnatifidum [Roxb. ex] D. Don, *Prodr. Fl. Nepal.*: 172 (1825).
Conyza trifida Buch.-Ham., in sched.
'in Nepaliâ'. (Syntype: specimen not found).
= **Conyza stricta** var. **pinnatifida** (D. Don) Kitam.
Roxburgh, *Hort. bengal.*: 61 (1814) cites Buchanan from Nepal but without further data.

Erigeron hieracifolium D. Don, *Prodr. fl. nepal.*: 172 (1825).
'in Nepaliâ'. (Syntype: specimen not found).
= **Blumea hieracifolia** (D. Don) DC.

Eupatorium acuminatum D. Don, *Prodr. fl. nepal.*: 171 (1825).
Eupatorium bhuibu? Buch.-Ham., in sched.
Narainhetty, 26 January 1803 (BM!-syntype).
= **Vernonia extensa** DC.

Eupatorium pyramidale D. Don, *Prodr. fl. nepal.*: 170 (1825).
Eupatorium bhuibu Buch.-Ham., in sched.
Narainhetty, 19 November 1802 (BM!-syntype).
= **Vernonia aspera** Buch.-Ham.

Gnaphalium busua [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 173 (1825).
Gnaphalium busua Buch.-Ham., in sched.
Sembu, 22 June 1802 (BM-syntype).
= **Anaphalis busua** (D. Don) DC.

Liatris latifolia D. Don, *Prodr. fl. nepal.*: 169 (1825).
Perdicium? triflorum Buch.-Ham., in sched.
Narainhetty, 11 February 1803 (BM-syntype).
= **Ainsliaea latifolia** (D. Don) Sch. Bip.

Senecio buimalia [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 178 (1825).

Cacalia volubilis *Buch.-Ham., in sched.*
'ad Narainhetty Nepalensium. Floret Novembri et Decembri'. (Syntype: specimen not found).
= **Cissampelopsis buimala** (D. Don) C. Jeffrey & Y.L. Chen

Senecio cappa [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 179 (1825).
Senecio cappa Buch.-Ham., in sched.
Narainhetty, 15 November 1802 (BM-syntype).
= **Synotis cappa** (D. Don) C. Jeffrey & Y.L. Chen

Senecio denudata D. Don, *Prodr. fl. nepal.*: 179 (1825).
Cineraria denudata Buch.-Ham., in sched.
Chitlong, 16 April 1802 (BM-syntype).
= **Senecio nudicaulis** [Buch.-Ham. ex] D. Don

Senecio jacobaea L., D. Don, *Prodr. fl. nepal.*: 179 (1825).
Senecio musuca Buch.-Ham., in sched.
Narainhetty, 18 November 1802 (BM!).
= **Senecio chrysanthemoides** DC.

Senecio triligulatus [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 178 (1825) 'triligulata'.
Senecio 3-ligulata Buch.-Ham., in sched.
Narainhetty, 3 December 1802 (BM-syntype).
= **Synotis triligulata** (D. Don) C. Jeffrey & Y.L. Chen

CONVOLVULACEAE

Porana racemosa Roxb., D. Don, *Prodr. fl. nepal.*: 98 (1825).
Porana dichotoma Buch.-Ham., in sched.; *Dinetus* [no species name given] Buch.-Ham., in sched.
Narainhetty, 29 September 1802 (BM!).
= **Dinetus racemosus** (Wall.) Sweet
Roxburgh, *Fl. Ind.* **2**: 41 (1824) based his description on plants introduced by Buchanan to the Calcutta Botanic Garden.

CORDIACEAE

Ehretia laevis Roxb., D. Don, *Prodr. fl. nepal.*: 102 (1825).
Gorasan, 11 February 1802 (BM!).

CORNACEAE

Cornus oblonga Wall. in Roxb., D. Don, *Prodr. fl. nepal.*: 140 (1825).
Cornus paniculata Buch.-Ham., in sched.
Narainhetty, 3 September 1802 (BM!).
= **Swida oblonga** (Wall.) Soják

CRUCIFERAE

Cardamine debilis D. Don, *Prodr. fl. nepal.*: 201 (1825).
Cardamine resedifolia L.?, Buch.-Ham., in sched.
'Narainhetty. Octobri' (Syntype: specimen not found).
= **Cardamine flexuosa** With.

Cardamine nasturtioides D. Don, *Prodr. fl. nepal.*: 201 (1825).
'in Nepaliâ'. (Syntype: specimen not found).
Hara, in *Enum. fl. pl. Nepal* **2**: 41 (1979), suggested this taxon might represent a form of *Cardamine scutata* subsp. *flexuosa* (With.) H. Hara i.e. *C. flexuosa* With.

CUPRESSACEAE

Juniperus chinensis? Buch.-Ham., in sched.
Narainhetty, 17 August 1802 (BM!).
= **Juniperus indica** Bertol.

Juniperus recurva [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 55 (1825).
'ad Narainhetty Nepaliae. Floret Februario'. (Syntype: specimen not found).

CYPERACEAE

Eleocharis congesta D. Don, *Prodr. fl. nepal.*: 41 (1825).
Scirpus congestus Buch.-Ham., in sched.
'in Nepaliâ'. [No original label]. (BM!-syntype).

Fimbristylis diphylla (Retz.) Vahl, *Enum. pl.* **2**: 289 (1806).
Bassaria, 9 March 1802 (BM!).
= **Fimbristylis dichotoma** (L.) Vahl

Scirpus elongatus [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 40 (1825).
Narainhetty, 9 November 1802 (BM!-syntype).
= **Eriophorum comosum** (Wall.) Wall. ex C.B. Clarke

DATISCACEAE

Datisca nepalensis D. Don, *Prodr. fl. nepal.*: 203 (1825).
'in Nepaliâ'. (Syntype: specimen not found).
= **Datisca cannabina** L.

DIOSCOREACEAE

Dioscorea obtusangula Buch.-Ham., in sched.
Suembu, 17 July 1802 (Sheet 1544.15 LINN-SM, microfiche!).
= **Dioscorea bulbifera** L.

Dioscorea pisiformis Buch.-Ham., in sched.
Narainhetty, 12 October 1802 (Sheet 1544.14 LINN-SM, microfiche!).

Rajania? cordata L., Buch.-Ham., in sched.
Suembu, 15 May 1802 (Sheet 1543.2 & 1543.3 LINN-SM, microfiche!).

DROSERACEAE

Drosera lunata [Buch.-Ham. ex] DC., *Prodr.* **1**: 319 (1824).
Sembu, 19 July 1802 (BM!-syntype).
= **Drosera peltata** var. **lunata** (DC.) C.B. Clarke

ELAEAGNACEAE

Elaeagnus arborea Roxb., D. Don, *Prodr. fl. nepal.*: 67 (1825).
Elaeagnus armata Buch.-Ham., in sched.
Narainhetty, 22 November 1802 (Sheet 228.6 LINN-SM, microfiche!); 4 March 1803 (Sheet 228.7 LINN-SM, microfiche!).
= **Elaeagnus infundibularis** Momiy.

Elaeagnus umbellata Thunb., D. Don, *Prodr. fl. nepal.*: 68 (1825).
Elaeagnus umbellatus Thunb., Buch.-Ham., in sched.
Chitlong, 13 April 1802 (Sheet 228.8 LINN-SM, microfiche!).
= **Elaeagnus parvifolia** Wall. ex Royle

ERICACEAE

Andromeda ovalifolia Wall., D. Don, *Prodr. fl. nepal.*: 148 (1825).
Andromeda capricida Buch.-Ham., in sched.

Suembu, 30 April 1802 (Sheet 789.35 LINN-SM, microfiche!).
= **Lyonia ovalifolia** (Wall.) Drude

Gaultheria fragrans D. Don, *Prodr. fl. nepal.*: 151 (1825), nom. superfl.
Arbutus laurifolia Buch.-Ham., in sched.
Narainhetty, 10 March 1803 (BM!); Chitlong, 10 April 1802 (Sheet 792.9 LINN-SM, microfiche!).
= **Gaultheria fragrantissima** Wall.

Brossaea procumbens Buch.-Ham., in sched.
Narainhetty, 3 February 1803 (Sheet 790.3 LINN-SM, microfiche!).
= **Gaultheria nummularioides** D. Don

Rhododendron arboreum Sm., *Exot. bot.* **1**: 9, t. 6 (1805).
Rhododendrum album [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 154 (1825), nom. superfl.
Nepal (Sheet 788.6 LINN-SM, microfiche!); Narainhetty, 3 March 1803 (Sheet 788.8 LINN-SM, microfiche!).
Don's citation of *R. purpureum* Buch.-Ham., in sched. suggests that there is one (or more) other Buchanan specimen(s) annotated with this name. None have been located at BM.

EUPHORBIACEAE

Euphorbia angustifolia [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 62 (1825).
Norcotera, 26 March 1802 (BM!-syntype).
= **Euphorbia dracunculoides** Lam.

Euphorbia fusiformis [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 62 (1825).
'in Nepaliâ' [No original label]. (BM!-syntype).

Euphorbia prolifera [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 62 (1825).
'in Nepaliâ' [No original label]. (BM!-syntype).

Euphorbia tenuis [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 61 (1825).
Bassaria, 10 March 1803 (BM!-syntype).
= **Euphorbia parviflora** L.

Myrica octandra [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 56 (1825).
Ettaura, 2 April 1802 (BM!-syntype).
= **Aporusa octandra** (D. Don) A.R. Vickery ex M. Short & A.R. Vickery

Phyllanthus parvifolius [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 63 (1825). 'parvifolia'.
Sembu, 5 June 1802 (BM!-syntype).

FAGACEAE

Quercus armata Roxb., D. Don, *Prodr. fl. nepal.*: 56 (1825).
Quercus catungea Buch.-Ham., in sched.
Narainhetty, 19 November 1802; Narainhetty, 26 July 1802; 29 July 1802; Suembu, 1 May 1802 (BM!-syntypes).
= **Castanopsis tribuloides** (Sm.) A. DC.

Quercus cassura [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 57 (1825).
'in Nepaliâ' [No original label]. (BM!-syntype).
= **Quercus semecarpifolia** Sm.

Quercus imbricata [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 57 (1825).
Narainhetty, 7 November 1802 (BM!-syntype).
= **Cyclobalanopsis lamellosa** (Sm.) Oerst.

Quercus lanuginosa D. Don, *Prodr. fl. nepal.*: 57 (1825), non Thuill. (1799).
Quercus banga Buch.-Ham., in sched.
Narainhetty, 17 December 1802 (BM!-syntype).
= **Quercus lanata** Sm.

Quercus phullata [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 57 (1825).
Narainhetty, 5 December 1802 (BM!-syntype); Suembu, 5 May 1802 (BM!-syntype).
= **Cyclobalanopsis glauca** (Thunb.) Oerst.

Quercus spicata Sm. in Rees, *Cycl.* **29**: n. 12 (1814), non Humb. & Bonpl. (1809).
Quercus arcaula Buch.-Ham., in sched.
Suembu, 5 May 1802 (BM!-syntype).
= **Lithocarpus grandifolius** var. **brevipetiolatus** (A.DC.) S.N. Biswas

FLACOURTIACEAE

Flacourtia infrafoliacea Buch.-Ham., in sched.
Malucona communis Buch.-Ham., in sched.
Sembu, 21 April 1802 (Sheet 1555.5.1 LINN-SM, microfiche!); Narainhetty, 14 October 1802 (Sheet 1555.5.2 LINN-SM, microfiche!).

Flacourtia sepiaria Roxb., Buch.-Ham., in sched.
Norcotera, 26 March 1802 (Sheet 1555.3 LINN-SM, microfiche!).

Flacourtia [no species name given]
Malucona communis? Buch.-Ham., in sched.
Tancote, 16 April 1802 (Sheet 1555.4 LINN-SM, microfiche).

GENTIANACEAE

***Exacum tetragonum** Roxb., Buch.-Ham., in sched.*
Narainhetty, 21 August 1802 (Sheet 203.7 LINN-SM, microfiche!).

Gentiana capitata [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 126 (1825).
Narainhetty, 3 February 1803 (BM!-syntype); Narainhetty, 12 January 1803 (Sheet 476.56.1 LINN-SM, microfiche!); Narainhetty, 6 March 1803 (Sheet 476.56.2 LINN-SM, microfiche!).

Gentiana decemfida [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 127 (1825).
Narainhetty, 5 February 1803 (Sheet 476.55 LINN-SM, microfiche!).
Although the locality matches that given in the protologue, Don states 'Floret Martio'. No specimen with this date has been located.

Menyanthes indica L., Buch.-Ham., in sched.
Sembu, 27 June 1802 (Sheet 276.7 LINN-SM, microfiche!).
= **Nymphoides indica** (L.) Kuntze

Swertia angustifolia [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 127 (1825).
Narainhetty, 13 September 1802 (BM!-syntype; Sheet 475.9 LINN-SM-syntype, microfiche!)

Swertia ciliata (G. Don) B.L. Burtt in *Notes Roy. Bot. Gard. Edinburgh* **26**: 272 (1965).
Narainhetty, 7 October 1802 (Sheet 475.11 LINN-SM, microfiche!).

Swertia quadriculata Buch.-Ham., in sched.
Narainhetty, 12 October 1802 (Sheet 475.10 LINN-SM, microfiche!).

GERANIACEAE

Geranium nepalense Sweet, D. Don, *Prodr. fl. nepal.*: 208 (1825).
Geranium quinquenerve Buch.-Ham., in sched.
'in Nepalia, ad ripas umbrosas fluvii Kuli Khana dicti. Floret Aprili'. (Specimen not found).

GUTTIFERAE

Brathys nepalensis Blume, *Mus. bot.* **2**: 19 (1856).
Catmandu, 13 May 1802 (BM!-syntype; L,-lectotype).
= **Hypericum japonicum** Thunb.
Lectotype designated by N.K.B. Robson in *Bull. Brit. Mus. (Nat. Hist.), Bot.* **20**: 129 (1990).

Hypericum bracteatum [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 217 (1825), nom. superfl.
Tancote, 16 April 1802 (BM!-lectotype).
H. [Hypericum] *lungusum* Buch.-Ham., in sched.
Narainhetty, 10 October 1802 (BM!-syntype).
= **Hypericum cordifolium** Choisy
BM specimen designated as lectotype by N.K.B. Robson in *Bull. Brit. Mus. (Nat. Hist.), Bot.* **12**: 213 (1985).

Hypericum japonicum Thunb., D. Don, *Prodr. fl. nepal.*: 219 (1825).
Hypericum dichotomum Buch.-Ham., in sched.
'in Nepaliâ in scaturiginosis prope urbem Katmandu. Floret Maio'. [No original label]. (BM!).

Hypericum nervosum D. Don, *Prodr. fl. nepal.*: 219 (1825), nom. superfl.
Narainhetty, 23 September 1802 (BM!).
= **Hypericum elodeoides** Choisy

Hypericum uralum [Buch.-Ham. ex] D. Don in *Bot. Mag.* **50**: t. 2375 (1823).
'in Nepaliâ ad Narainhetty'. [No original label]. (BM!-lectotype).
Lectotype designated by N.K.B. Robson in *Bull. Br. Mus. Nat. Hist. (Bot.)* **12** : 268 (1985).

HYDRANGEACEAE

Hydrangea aspera [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 211 (1825).
Narainhetty, 26 September 1802 (BM!-syntype).

LABIATAE

Ajuga decumbens sensu D. Don, *Prodr. fl. nepal.*: 108 (1825), non Thunb. (1784).
Bassaria, 21 February 1802 (BM!).
= **Ajuga macrosperma** var. **breviflora** Hook.f.

Ajuga integrifolia [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 108 (1825).
Ajuga alpina? Buch.-Ham., in sched.; *Ajuga pyramidalis L.?* Buch.-Ham., in sched.
Narainhetty, 18 September 1802 (BM!-syntype).
= **Ajuga bracteosa** Wall. ex Benth.

Colebrookea oppositifolia Sm., *Exot. bot.* **2**: 111, t. 115 (1805).
Selago? oppositifolia Buch.-Ham., in sched.
Muking, 21 January 1802 (BM!-syntype).
Smith cites Buchanan material collected 'by roadsides in Nepal, 1802' but without precise locality or date.

Perilla elata D. Don, *Prodr. fl. nepal.*: 115 (1825).
'in Nepaliâ'. (Syntype: specimen not found)
= **Elsholtzia blanda** (Benth.) Benth.

Perilla fruticosa D. Don, *Prodr. fl. nepal.*: 115 (1825).
Mentha fruticosa Buch.-Ham., in sched.
'in Nepaliâ' (BM!-syntype).
= **Elsholtzia fruticosa** (D. Don) Rehder
The original label gives a description of the plant but no date or locality.

Perilla leptostachya D. Don, *Prodr. fl. nepal.*: 115 (1825).
Nepeta imubus Buch.-Ham., in sched.
Narainhetty, 20 October 1802 (BM!-syntype).
= **Elsholtzia stachyodes** (Link) Raizada & Saxena

Perilla ocimoides L., D. Don, *Prodr. fl. nepal.*: 114 (1825).
Mentha perilloides L., Buch.-Ham., in sched.
Narainhetty, 1 October 1802 (BM!).
= **Perilla frutescens** (L.) Britton

Perilla polystachya D. Don, *Prodr. fl. nepal.*: 114 (1825).
Mentha? cristata Buch.-Ham., in sched.
'in Nepaliâ'. (Syntype: specimen not found)
= **Elsholtzia fruticosa** (D. Don) Rehder

Plectranthus coetsa [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 117 (1825).
Germanea coetsa Buch.-Ham., in sched.
Narainhetty, 21 October 1802 (BM!-syntype).
= **Isodon coetsa** (D. Don) Kudô

Plectranthus ternifolius D. Don, *Prodr. fl. nepal.*: 117 (1825), 'ternifolia'.
Lavendula ternifolia Buch.-Ham., in sched.; *Plectranthus buchia* Buch.-Ham., in sched.
Narainhetty, 18 September 1802 (BM!-syntype).
= **Isodon ternifolius** (D. Don) Kudô

Plectranthus virgatus D. Don, *Prodr. fl. nepal.*: 116 (1825) 'virgata', non *Ocimum virgatum* Thunb. ex Murray (1784).
Ocymum virgatum Thunb., Buch.-Ham., in sched.
Ettaura, 2 April 1803 (BM!-syntype).
= **Orthosiphon rubicundus** (D. Don) Benth.

Scutellaria indica sensu D. Don, *Prodr. fl. nepal.*: 109 (1825), non L. (1751).
Narainhetty, 3 August 1802 (BM!).
= **Scutellaria discolor** Colebr.

Scutellaria repens [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 110 (1825).
Narainhetty, 4 October 1802 (BM!-syntype).

Scutellaria scandens [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 110 (1825).

Scutellaria albida? Buch.-Ham., in sched.
Tomba Cana, Nepalia, 22 March 1803 (BM!-syntype).

Teucrium laxum D. Don, *Prodr. fl. nepal.*: 109 (1825).
Ajuga laxa Buch.-Ham., in sched.
'in Nepaliâ'. [No original label]. (BM!-syntype).

Teucrium quadrifarium [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 108 (1825).
Narainhetty, 27 August 1802 (BM!-syntype).

Thymus piperitus D. Don, *Prodr. fl. nepal.*: 112 (1825).
Marrubium piperitum Buch.-Ham., in sched.
Narainhetty, 8 March 1803 (BM!-syntype).
= **Clinopodium piperitum** (D. Don) Murata
Don also cites Roxburgh, *Hort. bengal.*: 44 (1814), who lists a Buchanan-Hamilton specimen collected from Nepal in 1802.

Thymus repens D. Don, *Prodr. fl. nepal.*: 113 (1825).
Clinopodium repens Buch.-Ham., in sched.
Sembu, 25 May 1802 (BM!-syntype).
= **Clinopodium umbrosum** (M. Bieb.) K. Koch

LAURACEAE

Cinnamomum cathia D. Don, *Prodr. fl. nepal.*: 66 (1825).
Laurus cathia Buch.-Ham., in sched.
Suembu, 1 June 1802 (BM!; Sheet 707.42 LINN-SM, microfiche!-syntypes).
= **Phoebe cathia** (D. Don) Kosterm.

Cinnamomum tomentosum D. Don, *Prodr. fl. nepal.*: 66 (1825).
Laurus tomentosa Buch.-Ham., in sched.
Suembu, 19 April 1802 (BM!; Sheet 707.41 LINN-SM, microfiche!-syntypes).
= **Phoebe cathia** (D. Don) Kosterm.

Laurus cuneata Buch.-Ham., in sched.
Chitlong, 10 April 1802 (Sheet 707.44 LINN-SM, microfiche!).

Laurus cuspidata D. Don, *Prodr. fl. nepal.*: 64 (1825).
Tomex bolo Buch.-Ham., in sched.
Narainhetty, 11 March 1803 (Sheet 847.4 LINN-SM, microfiche!-syntypes); Narainhetty, 3 January 1803 (Sheet 847.5 LINN-SM, microfiche!); Kargoo, Nepal, 21 March 1803 (Sheet 847.6 LINN-SM, microfiche!).
= **Lindera melastomacea** (Nees) Villar

Laurus gushia Buch.-Ham., in sched.
Narainhetty, 17 November 1802 (Sheet 707.24 LINN-SM, microfiche!).

Laurus jacaricata Buch.-Ham., in sched.
Catmandu, 12 May 1802 (Sheet 707.43 LINN-SM, microfiche!).

Laurus? *lateralis* Buch.-Ham., in sched.
Catmandu, 13 May 1802 (Sheet 707.23 LINN-SM, microfiche!).

Laurus nacusua D. Don, *Prodr. fl. nepal.*: 64 (1825).
Laurus nancushia Buch.-Ham., in sched.
Narainhetty, 10 March 1803 (BM!; Sheet 707.22 LINN-SM, microfiche!-syntypes).
= **Lindera nacusua** (D. Don) Merr.

Laurus umbellata [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 64 (1825), non Thunb. (1784).
Chisapany, 9 April 1802 (BM!; Sheet 707.21 LINN-SM, microfiche!-syntypes).
= **Lindera nacusua** (D. Don) Merr.

Tetranthera cuipala [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 65 (1825).
Laurus cuipala Buch.-Ham., in sched.
Narainhetty, 27 February 1803 (BM!; Sheet 707.25 LINN-SM, microfiche!-syntypes); Narainhetty, 9 January 1803 (Sheet 707.26 LINN-SM, microfiche!).
= **Neolitsea cuipala** (D. Don) Kosterm.
Sheet 707.26 LINN-SM is not a syntype as Don gives the flowering time as February.

Tetranthera doshia D. Don, *Prodr. fl. nepal.*: 65 (1825).
Tomex doshia Buch.-Ham., in sched.
Narainhetty, 1 November 1802 (BM!; Sheet 847.7 LINN-SM, microfiche!-syntypes).
= **Litsea doshia** (D. Don) Kosterm.

Tomex ?*lampatia* Buch.-Ham., in sched.
Narainhetty, 17 February 1803 (Sheet 847.3 LINN-SM, microfiche!).

LEGUMINOSAE

Aspalanthus cuneata D. Don, *Prodr. fl. nepal.*: 246 (1825).
Anthyllis cuneata Buch.-Ham., in sched.; *Hedysarum junceum* L.f., Buch.-Ham., in sched.
Narainhetty, 2 October 1802 (BM!-syntype).
= **Lespedeza juncea** var. **sericea** (Thunb.) F.B. Forbes & Hemsl.

Astragalus stipulatus [D. Don ex] Sims in *Bot. Mag.* **50**: t. 2380 (1823), D. Don, *Prodr. fl. nepal.*: 246 (1825).
Astragalus lanceolatus Buch.-Ham., in sched.; *Coronilla stipulata* Buch.-Ham., in sched.
Gorasan, 18 March 1802 (BM!-syntype).

Cassia dimidiata [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 247 (1825).
Narainhetty, 8 July 1802 (BM!-syntype).
= **Cassia mimosoides** subsp. **lechenaultiana** (DC.) H. Ohashi
Don also cites Roxburgh, *Hort. bengal.*: 32 (1814), who lists a Buchanan-Hamilton specimen collected from Nepal in 1801.

Crotalaria alata [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 241 (1825).
Sembu, 17 July 1802 (BM!-syntype).

Crotalaria anthylloides Lam., D. Don, *Prodr. fl. nepal.*: 241 (1825).
Crotalaria salicifolia Buch.-Ham., in sched.
'in Nepaliâ ad Narainhetty. Floret Octobri'. (Specimen not found).
= **Crotalaria sessiliflora** L.

Crotalaria linifolia sensu D. Don, *Prodr. fl. nepal.*: 241 (1825), non L.f. (1782).
Crotalaria pilosa Buch.-Ham., in sched.
Narainhetty, 23 September 1802 (BM!).

Crotalaria polygalifolia Buch.-Ham., in sched.; *Crotalaria prostrata* Buch.-Ham., in sched.
Bassaria, 4 March 1802 (BM!).
= **Crotalaria albida** [Heyne ex] Roth

Crotalaria prostrata sensu D. Don, *Prodr. fl. nepal.*: 241 (1825), non Rottb. (1809).
Crotalaria ciliata Buch.-Ham., in sched.
'in Nepaliâ'. (Specimen not found).
= **Crotalaria humifusa** Benth.

Crotalaria psoralioides D. Don, *Prodr. fl. nepal.*: 242 (1825), non Lam. (1786), nom. superfl.
Crotalaria ?cytissoides Buch.-Ham., in sched.
Narainhetty, 10 August 1802 (BM!).
= **Crotalaria cytisoides** Roxb. ex DC.
Don also cites Roxburgh, *Hort. bengal.*: 54 (1814), who lists a Buchanan-Hamilton specimen collected from Nepal in 1801.

Crotalaria tuberosa [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 241 (1825).
Borbonia tuberosa Buch.-Ham., in sched.
Narainhetty, 28 September 1802 (BM!-syntype).
= **Eriosema himalaicum** H. Ohashi

Dalbergia sericea G. Don, *Gen. hist.* **2**: 375 (1832).
Churiaghant hills, 31 March 1802 (BM!-syntype).

Hedysarum dioicum [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 244 (1825).
Narainhetty, 25 September 1802 (BM!-syntype).
= **Desmodium confertum** DC.

Hedysarum retusum [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 243 (1825).
Narainhetty, 2 September 1802 (BM!-syntype).
= **Desmodium concinnum** var. **retusum** (D. Don) H. Ohashi

Hedysarum sambuense D. Don, *Prodr. fl. nepal.*: 243 (1825).
Hedysarum suembum Buch.-Ham., in sched.
Suembu, 16 July 1802 (BM!-syntype).
= **Desmodium multiflorum** DC.

Hedysarum tenellum [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 243 (1825).
Narainhetty, 6 October 1802 (BM!-syntype).
= **Desmodium microphyllum** (Thunb.) DC.

Indigofera atropurpurea [Buch.-Ham. ex] Hornem., *Hort. bot. Hafn. Suppl.*: 152 (1819).
Indigofera atropurpurea [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 244 (1825), nom. superfl.
Narainhetty, 7 February 1803 (BM!-syntype).
Don also cites Roxburgh, *Hort. bengal.*: 57 (1814), who lists a Buchanan specimen collected from Nepal but without date or other locality information.

Indigofera dosua [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 244 (1825).
Suembu, 7 July 1802 (BM!-syntype).

Indigofera trifoliata L., Buch.-Ham., in sched.
Sembu, 23 July 1802 (BM!).

Manna nepalensis D. Don, *Prodr. fl. nepal.*: 247 (1825).
Genista juasi Buch.-Ham., in sched.; *Hedysarum alhagi* L., Buch.-Ham., in sched.
Sitaucund, 21 April 1803 (BM!-syntype).
= **Alhagi nepalensis** (D. Don) Shap.

Sitacund is in Chittagong (now Bangladesh). Either the date on the specimen is incorrect, (Buchanan having left Nepal in March 1803) and probably should read 21 April 1802, or this plant was not described from Nepal.

Parochetus communis [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 240 (1825).
Glycine proscimum Buch.-Ham.?, in sched.; *Parochetus communis* Buch.-Ham., in sched.
Narainhetty, 24 October 1802 (BM!-syntype).

Parochetus major D. Don, *Prodr. fl. nepal.*: 241 (1825).
'in Nepaliâ'. (Syntype: specimen not found).
= **Parochetus communis** [Buch.-Ham. ex] D. Don

LENTIBULARIACEAE

Utricularia confervaefolia [Jackson ex] D. Don, *Prodr. fl. nepal.*: 84 (1825).
Utricularia vulgaris Buch.-Ham., in sched.
Narainhetty, 3 September 1802 (BM!-syntype); Narainhetty (Sheet 52.13 LINN-SM-syntype, microfiche!).
= **Utricularia aurea** Lour.
The name is apparently based on a Jackson name on a specimen in Herb Lambert.

LILIACEAE s.l.

(ASPARAGACEAE)

Asparagus albus Buch.-Ham., in sched.
Gorasan, 20 March 1802 (Sheet 600.10 LINN-SM, microfiche!).

Asparagus curillus [Buch.-Ham. ex] Roxb., *Fl. ind. ed. 1832* **2**: 152 (1832).
Sembu, 22 June 1802 (BM? specimen not found; Sheet 600.9 LINN-SM, microfiche!).
Hara, in *Enum. fl. pl. Nepal* **1**: 71 (1978) cites 'Buch.Ham. (Herb. Roxb., type of *A. curillus)*' and notes that 'Hamilton's *A. curillus* (BM & E) seems to be a mixture of this plant and *A. racemosus* [i.e. *A. racemosus* Willd.], but Roxburgh's plate of *A. curillus* at Kew shows short flattish cladophylla'. Hara may well have meant that the Roxburgh icones should be taken as the type. In any case, no Buchanan-Hamilton specimen has been located at BM.
Roxburgh, *Fl. ind. ed. 1832* **2**: 152 (1832) cites material grown in the Calcutta Botanic Garden from seed supplied by Buchanan.

Asparagus filicinus [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 49 (1825).
Sembu, 2 June 1802 (BM!; Sheet 600.6 LINN-SM, microfiche!;-syntypes).

(UVULARIACEAE)

Disporum pitsutum D. Don, *Prodr. fl. nepal.*: 50 (1825).
Uvularia pitsutu Buch.-Ham., in sched.
Chitlong, 10 April 1802 (BM!-syntype); Chitlong, 11 April 1802 (Sheet 586.3 LINN-SM, microfiche!-syntypes).
= **Disporum cantoniense** var. **parviflorum** (Wall.) H. Hara

(LILIACEAE)

Lilium japonicum Thunb., D. Don, *Prodr. fl. nepal.*: 52 (1825).
Lilium batisua Buch.-Ham., in sched.

Narainhetty, 2 August 1802 (BM!); 26 July 1802 (Sheet 584.12 LINN-SM, microfiche!).
= **Lilium wallichianum** Schult. & Schult.f.

(TRILLIACEAE)

Paris polyphylla Sm., in Rees, *Cycl.* **26**: Paris n. 2 (1813).
Paris diasua Buch.-Ham., in sched.
Narainhetty, 13 March 1803 (Sheet 703.4.1 LINN-SM, microfiche!-syntype); Narainhetty, 17 March 1803 (BM!-syntype).

(ANTHERICACEAE)

Phalangium anceps Buch.-Ham., in sched.
Suembu, 4 July 1802 (Sheet 596.9 LINN-SM, microfiche!).
= **Chlorophytum nepalense** (Lindl.) Baker

(SMILACACEAE)

Smilax maculata [Roxb. ex] D. Don, *Prodr. fl. nepal*: 49 (1825).
Smilax capitata Buch.-Ham., in sched.
Narainhetty, 18 September 1802 (BM!-syntype); Narainhetty, 17 September 1802 (Sheet 1542.14 LINN-SM, microfiche!-syntype).
= **Smilax aspera** L.
Don also cites Roxburgh, *Hort. bengal.*: 72 (1814), who lists a Buchanan-Hamilton specimen collected from Nepal but without further data.

Smilax ovalifolia [Roxb. ex] D. Don, *Prodr. fl. nepal.*: 49 (1825).
Smilax columnifera Buch.-Ham., in sched.
'ad Narainhetty Nepalensium. Floret Septembri'. Narainhetty, 7 February 1803 (Sheet 1542.15 LINN-SM, microfiche!-syntype).
Both specimens are from the type locality but Don gives the flowering time as February.

(CONVALLARIACEAE)

Sultea elatior Buch.-Ham., in sched.
Narainhetty, 2 October 1802 (Sheet 601.13 LINN-SM, microfiche!).
= **Ophiopogon clarkei** Hook.f.
Sultea humilior Buch.-Ham., in sched.
Narainhetty, 27 July 1802 (Sheet 601.14.1 LINN-SM, microfiche!); Narainhetty, 21 August 1802 (Sheet 601.14.2 LINN-SM, microfiche!)
= **Ophiopogon wallichianus** (Kunth) Hook.f.

Tupistra aurantica ([Wall. ex] Baker) Hook.f., *Fl. Brit. India.* **6**: 325 (1892).
Pilcusta sylvatica Buch.-Ham., in sched.
Narainhetty, 13 March 1803 (BM!); 16 March 1803 (Sheets 614.4 & 614.5 LINN-SM, microfiche!).

LINACEAE

Linum cicanobum [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 217 (1825).
Narainhetty, 5 December 1802 (BM!-syntype).
= **Reinwardtia cicanoba** (D. Don) H. Hara

Linum repens [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 217 (1825).
Linum semitrigynum Buch.-Ham., in sched.
Narainhetty, 5 November 1802 (BM!-syntype).
= **Reinwardtia indica** Dumort.

LOGANIACEAE

Buddleja paniculata Wall., D. Don, *Prodr. fl. nepal.*: 92 (1825).
Budleja shina Buch.-Ham., in sched.
Narainhetty, 7 February 1803 (BM!)
Budleja fastigiata Buch.-Ham, in sched.
Tombah Cana, 22 March 1803 (BM!).
Budleja tomentosa Buch.-Ham., in sched; *Budleja nimda* Buch.-Ham., in sched.
Narainhetty, 30 December 1802 (BM!).

Buddleja subserrata [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 92 (1825), nom. superfl.
Bassaria, 27 February 1802 (BM!);
Budleia shina Buch.-Ham., in sched.; *Budleia simba* Buch.-Ham., in sched.
Narainhetty, 3 November 1802 (BM!).
= **Buddleja asiatica** Lour.
Don's name is a superfluous epithet for *B. neemda* Roxb., *Fl. ind.* **1**: 411 (1820), based in part on material introduced to Calcutta Botanic Garden by Buchanan-Hamilton.

LORANTHACEAE

Loranthus odoratus Wall., D. Don, *Prodr. fl. nepal.*: 143 (1825).
Loranthus hexapetala Buch.-Ham., in sched.
Narainhetty, 13 November 1802 (BM!).

Viscum dichotomum D. Don, *Prodr. fl. nepal.*: 142 (1825).
Viburnum dichotomum Buch.-Ham., in sched.
Narainhetty, 17 December 1802 (BM!-syntype).
= **Viscum articulatum** Burm.f.

Viscum stellatum [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 142 (1825).
Suembu, 3 June 1802 (BM!-syntype).
= **Viscum album** L.

LYTHRACEAE

Ammannia rubra [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 220 (1825).
'in Nepaliâ' [No original label]. (BM!-syntype).
= **Rotala rubra** (D. Don) H. Hara

Ammannia rotundifolia [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 220 (1825).
'in Nepaliâ' (Syntype: specimen not found).
= **Rotala rotundifolia** (D. Don) Koehne
Don also cites Roxburgh, *Hort. bengal.*: 11 (1814) which lists a Buchanan-Hamilton specimen from Chittagong, 1796. The only specimen located at BM lacks an original label but is annotated 'Mysoor', without further information.

MAGNOLIACEAE

Michelia doltsopa [Buch.-Ham. ex] DC., *Syst. nat.* **1**: 448 (1817).
Narainhetty, 9 February 1803 (BM!-syntype).
A specimen at BM collected by Buchanan-Hamilton from C. Nepal was identified by Dandy as a hybrid between *Michelia doltsopa* and *Michelia champaca* L. (cf. Dandy in *J. Bot.* **65**: 278 (1927). It has not been located.

Michelia kisopa [Buch.-Ham. ex] DC., *Syst. nat.* **1**: 448 (1817).
Narainhetty, 22 October 1802 (BM!-syntype).

MELASTOMATACEAE

Arthrostemma paniculatum D. Don in *Mem. Wernerian. nat. Hist. Soc.* **4**: 299 (1822). D. Don, *Prodr. fl. nepal.*: 222 (1825).
Rhexia hari Buch.-Ham., in sched.; *Rhexia paniculata* Buch.-Ham., in sched.
Narainhetty, 6 October 1802 (BM!-syntype).
= **Oxyspora paniculata** (D. Don) DC.

Melastoma normale D. Don, *Prodr. fl. nepal.*: 220 (1825), 'normalis'.
'in Nepaliâ'. (Syntype: specimen not found).
Hara, *Enum. fl. pl. Nepal* **2**: 170 (1979) cites *Wallich* s.n., ann. 1818 as 'possibly type of *M. normale*'. This suggestion is erroneous as Don cites only the Buchanan-Hamilton collection.

Osbeckia chulesis D. Don, *Prodr. fl. nepal.*: 221 (1825).
Melastoma chulese Buch.-Ham., in sched.
Narainhetty, 27 July 1802 (BM!-syntype).
= **Osbeckia nepalensis** Hook.
Cited as type of *O. chulesis* by Hara, *Enum. Fl. Pl. Nepal* **2**: 170 (1979).

Osbeckia rostrata D. Don, *Prodr. fl. nepal.*: 221 (1825).
Melastoma? rostratum Buch.-Ham., in sched.
Narainhetty, 11 August 1802 (BM!-syntype).

Osbeckia speciosa D. Don, *Prodr. fl. nepal.*: 222 (1825), nom. superfl.
Melastoma humile Buch.-Ham., in sched.
Narainhetty, 28 July 1802 (BM! synype?).
= **Osbeckia nepalensis** Hook.
One of several elements in the protologue of *O. nepalensis* Hook., a name cited by Don.

Osbeckia stellata [Buch.-Ham. ex] D. Don in *Bot. Reg.* **8**: t. 674 (1822).
Melastoma stellatum Buch.-Ham., in sched.
Narainhetty, 10 August 1802 (BM!-lectotype).
Lectotype cited by Hara, *Enum. fl. pl. Nepal* **2**: 171 (1979).

Osbeckia ternifolia D. Don, *Prodr. fl. nepal.*: 221 (1825).
Osbeckia quaterna Buch.-Ham., in sched.
'in Nepaliâ' [No original label]. (BM!-syntype).
The specimen was annotated as holotype of *Osbeckia stellata* var. *rostrata* (D. Don) by Carlo Hansen, 1974.
= **Osbeckia rostrata** D. Don

MENISPERMACEAE

Cissampelos angulata Buch.-Ham., in sched.
Cissampelos bahapo Buch.-Ham., in sched.
Sembu, 28 May 1802 (Sheet 1567.5 LINN-SM, microfiche!).

Cissampelos hirsuta [Buch.-Ham. ex] DC., *Syst. nat.* **1**: 535 (1817).
Suembu, 21 May 1802 (BM!; Sheet 1567.6 LINN-SM, microfiche!-syntypes).
= **Cissampelos pareira** var. **hirsuta** (DC.) Forman

MORACEAE

Ficus cabur [Buch.-Ham. ex] Sm. in Rees, *Cycl.* **14**: Ficus n. 47 (1810).
Narainhetty, 10 February 1803 (Sheet 1610.41 LINN-SM, microfiche!-syntype).
= **Ficus sarmentosa** Sm.

Ficus citrifolia? Roxb., Buch.-Ham., in sched.
Narainhetty, 21 February 1803 (Sheet 1610.39 LINN-SM, microfiche!).

Ficus infrafoliacea [Buch.-Ham. ex] Sm., in Rees, *Cycl.* **14**: Ficus n. 31 (1810).
Lohiar, by roadsides in Nepal, 29 March 1803 (Sheet 1610.44 LINN-SM, microfiche!-syntype).
= **Ficus virens** Ait.

Ficus neriifolia Sm. in Rees, *Cycl.* **14**: Ficus n. 21 (1810).
'Narainhetty, Upper Nepal, 10 February 1803'. (Specimen not found).
This specimen would be expected to be in LINN-Smith but no sheet has been located. The details given in the protologue exactly match those on the sheet of *F. cabur*.

Ficus pilashi Sm., in Rees, *Cycl.* **14**: Ficus n. 3 (1810).
Narainhetty, 28 December 1802 (Sheet 1610.43 LINN-SM, microfiche!-syntype).
= **Ficus virens** var. **sublanceolata** (Miq.) Corner

Ficus sarmentosa [Buch.-Ham. ex] Sm. in Rees, *Cycl.* **14**: Ficus n. 45 (1810).
Sembu, woods in Upper Nepal, 28 May 1802 (Sheet 1610.40 LINN-SM, microfiche!-syntype).

Ficus semicordata [Buch.-Ham. ex] Sm. in Rees, *Cycl.* **14**: Ficus n. 71 (1810).
Ficus cunea Buch.-Ham., in sched.
Hettaura, woods in Upper Nepal, 4 April 1802 (Sheet 1610.26 LINN-SM, microfiche!-syntype).

Ficus subincisa [Buch.-Ham. ex] Sm. in Rees, *Cycl.* **14**: Ficus n. 91 (1810).
Narainhetty, on rocks, 28 January 1803 (Sheet 1610.42 LINN-SM, microfiche!-syntype).

MYRICACEAE

Myrica esculenta [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 56 (1825).
Narainhetty, 3 September 1802 (BM!-syntype).

MYRSINACEAE

Baebotrys gocala Buch.-Ham., in sched.
Narainhetty, 17 February 1803 (Sheet 346.8 LINN-SM, microfiche!).

Embelia esculenta D. Don, *Prodr. fl. nepal.*: 147 (1825), nom. superfl.
Samara? esculenta Buch.-Ham., in sched.
Narainhetty, 5 January 1803 (BM!)
= **Embelia floribunda** Wall.

Embelia nagushia D. Don, *Prodr. fl. nepal.*: 147 (1825), nom. superfl.
Samara? nagushia Buch.-Ham., in sched.
Narainhetty, 20 October 1802 (BM!).
= **Embelia vestita** Roxb.

Maesa chisia [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 148 (1825).

Baebotrys chishia Buch.-Ham., in sched.
Narainhetty, 10 January 1803 (BM!); Narainhetty, 9 February 1803 (Sheet 346.4 LINN-SM, microfiche!).
The type locality is Narainhetty but Don gives the flowering time as April. No specimens with this date have been located.

Maesa tomentosa D. Don, *Prodr. fl. nepal.*: 148 (1825).
Baebotrys tomentosa Buch.-Ham., in sched.
Churiaghant Hills, 31 March 1802 (BM!; Sheet 346.10 LINN-SM, microfiche!-syntypes).
= **Maesa macrophylla** (Wall.) A. DC.

Maesa viridiflora Buch.-Ham., in sched.
Pherphing, 20 March 1803 (Sheet 392.6 LINN-SM, microfiche!).

Manglilla bilrhi Buch.-Ham., in sched.
Narainhetty, 17 October 1802 (LINN microfiche!).
= **Myrsine capitellata** Wall.

Myrsine excelsa D. Don, *Prodr. fl. nepal.*: 147 (1825).
Manglilla? [no species given] Buch.-Ham., in sched.
Narainhetty, 17 October 1802 (BM!-syntype).
= **Myrsine capitellata** Wall.

Myrsine potama D. Don, *Prodr. fl. nepal.*: 146 (1825).
Samara? potama Buch.-Ham., in sched.
'an Narainhetty Nepaliae. Floret Februario'. (Syntype: specimen not found).
= **Myrsine africana** L.

Myrsine sessilis D. Don, *Prodr. fl. nepal.*: 146 (1825).
Samara sessilis Buch.-Ham., in sched.
'in Nepaliae sylvis ad Narainhetty. Floret Octobri'. (Syntype: specimen not found).
= **Myrsine semiserrata** Wall.

Myrsine subspinosa D. Don, *Prodr. fl. nepal.*: 147 (1825).
Samara? subspinosa Buch.-Ham., in sched.
Narainhetty, 1 February 1803 (BM!-syntype) .
= **Myrsine semiserrata** Wall.

OCHNACEAE

Ochna pumila [Buch.-Ham. ex] DC., *Prodr.* **1**: 736 (1824).
Terriany forest, Nepalia, 30 March 1802 (BM!-syntype).
= **Ochna obtusata** var. **pumila** (DC.) Kanis

OLACACEAE

Schoepfia fragrans Wall., D. Don, *Prodr. fl. nepal.*: 145 (1825).
Symphoricarpos ?odoratus Buch.-Ham., in sched.
Narainhetty, 28 September 1802 (BM!).

OLEACEAE

Jasminum dichotomum D. Don, *Prodr. fl. nepal.*: 105 (1825), non Vahl (1790).
Mogorium dichotomum Buch.-Ham., in sched.
Sembu, 26 May 1802 (BM!-syntype).
= **Jasminum nepalense** Spreng.

Jasminum dispermum Wall., D. Don, *Prodr. fl. nepal.*: 105 (1825).
Jasminum latifolium Buch.-Ham., in sched.
Tancote, 15 April 1802 (BM!).

Jasminum heterophyllum Roxb., D. Don, *Prodr. fl. nepal.*: 106 (1825).
Jasminum arboreum Buch.-Ham., in sched.
Suembu, 30 April 1802 (BM!-syntype?).
= **Jasminum subhumile** W.W. Sm.
Roxburgh in *Fl. ind.* **1**: 411 (1820) based this name on material introduced to Calcutta Botanic Garden by Buchanan. The BM specimen may represent an original voucher of this material and is possibly a syntype.

Jasminum pubescens (Retz.) Willd., D. Don, *Prodr. fl. nepal.*: 105 (1825).
'in Nepaliâ ad Narainhetty. Floret Octobri' (Specimen not found).
A specimen at BM from Narainhetty, 28 October 1802, is annotated by Buch.-Ham. '*Mogorium hirsutum* Plant. Luccass.' This may be the specimen referred to by Don, despite his omission of the epithet.
= **Jasminum multiflorum** (Burm.f.) Andrews

Ligustrum bracteolatum D. Don, *Prodr. fl. nepal.*: 107 (1825).
Ligustrum? japonicum? Buch.-Ham., in sched.
Suembu, 17 June 1802 (BM!-syntype?).
= **Ligustrum nepalense** Wall.
Buchanan-Hamilton, Sambu [*sic*] 17 & 18 June 1802 are given as syntypes by P.S. Green in *Kew Bull.* **50**: 380 (1995). The specimen dated 18 June has not been located.
Ligustrum bracteolatum is based on a manuscript name in Herb. Lambert but no sheet with this annotation has been found.

Ligustrum spicatum [Buch.-Ham. ex] D Don, *Prodr. fl. nepal.*: 107 (1825), nom. superfl.
'in Nepaliae montosis' (BM?). Material on loan: not seen.
= **Ligustrum nepalense** Wall.

Notelaea posua D. Don, *Prodr. fl. nepal.*: 107 (1825).
Olea posua Buch.-Ham., in sched.
Narainhetty, 18 October 1802 (BM!-syntype).
= **Osmanthus fragrans** var. **longifolius** (DC.) H. Hara

ONAGRACEAE

Epilobium brevifolium D. Don, *Prodr. fl. nepal.*: 222 (1825).
Epilobium montanum L.? Buch.-Ham., in sched.
'in Nepalia superiore' (BM?-syntype). Material on loan: not seen.

ORCHIDACEAE

Aerides calceolaris [Buch.-Ham. ex] Sm. in Rees, *Cycl.* **39**: Aerides n. 11 (1819).
Gastrochilus calceolaris (Sm.) D. Don, *Prodr. fl. nepal.*: 32 (1825).
Epidendrum calceolare Buch.-Ham., in sched.
Narainhetty, 15 February 1803 (Sheet 1404.29 LINN-SM, microfiche!-syntype).
= **Gastrochilus calceolaris** (Sm.) D. Don

Aerides dasypogon Sm. in Rees, *Cycl.* **39**: Aerides n. 10 (1819).
Napaul (Sheet LINN-SM, microfiche!-syntype).
= **Gastrochilus dasypogon** (Sm.) O. Kuntze
Cited as holotype by Ji in *Guihaia* **16**: 142 (1996).

Aerides rigida [Buch.-Ham. ex] Sm. in Rees, *Cycl.* **39**: Aerides n. 12 (1819).
Napaul (Sheet LINN-SM, microfiche!-syntype).
= **Acampe rigida** (Sm.) P.F. Hunt

Aerides spicatum D. Don, *Prodr. fl. nepal.*: 31 (1825).
Epidendrum hippium Buch.-Ham., in sched.
Suembu, 22 June 1802 (BM!; Sheet 1404.28 LINN-SM, microfiche!-syntypes).
= **Rhynchostylis retusa** (L.) Blume

Bletia bicallosa D. Don, *Prodr. fl. nepal.*: 30 (1825).
Limodorum bicallosum Buch.-Ham., in sched.
'in Nepaliâ' [No original label]. (BM!-syntype); Terriany forest, 30 March 1802 (Sheet 1402.8 LINN-SM, microfiche!-syntype).
= **Eulophia bicallosa** (D. Don) P.F. Hunt & Summerh.

Bletia dabia D. Don, *Prodr. fl. nepal.*: 30 (1825).
Limodorum dabia Buch.-Ham., in sched.
'in Nepaliâ' [No original label]. (BM!-syntype); Gorasan, Lower Nepal, 30 January 1802 (Sheet 1402.6 LINN-SM, microfiche!-syntype).
= **Eulophia dabia** (D. Don) Hochr.

Bletia graminifolia D. Don, *Prodr. fl. nepal.*: 29 (1825).
Limodorum graminifolium Buch.-Ham., in sched.;
Suembu, 15 July 1802 (BM! Sheet 1397.38 LINN-SM, microfiche!-syntypes); Narainhetty, 8 August 1802 (Sheet 1397.39 LINN-SM, microfiche!).
= **Arundina graminifolia** (D. Don) Hochr.

Bletia masuca D. Don, *Prodr. fl. nepal.*: 30 (1825).
Zoduba masuca Buch.-Ham., in sched.
Narainhetty, 21 February 1803 (BM!; Sheet 1403.11.1 LINN-SM, microfiche!-syntypes).
= **Calanthe masuca** (D. Don) Lindl.

Epidendrum angustifolium Swartz, *Prodr.*: 123 (1783).
Narainhetty, 10 October 1802 (Sheet 1397.35.1 LINN-SM, microfiche!).

Epidendrum bifarium Swartz, *Schrad. J. Bot.* **2**: 212 (1799).
Pholiota imbricata Buch.-Ham., in sched.
Suembu, 16 June 1802 (Sheet 1397.25.1 LINN-SM, microfiche!).

Epidendrum cuybua Buch.-Ham., in sched.
Suembu, 22 June 1802 (Sheet 1404.17.1 LINN-SM, microfiche!).

Epidendrum damun-sultea Buch.-Ham., in sched.
Suembu, 15 May 1802 (Sheet 1404.21 LINN-SM, microfiche!).

Epidendrum geniculatum Buch.-Ham. in Hook.f., *Fl. Brit. India* **6**: 45 (1890), nom. nud. in syn.
Epidendrum gemellum Buch.-Ham., in sched.
Hettaura, 2 April 1802 (Sheet 1404.18 LINN-SM, microfiche!).
= **Aerides multiflora** Roxb.

Epidendrum humile Sm., *Exot. bot.* **2**: 75, t. 98 (1806).
'Upper Nepal' (Sheet LINN-SM, microfiche-syntype).
= **Pleione humilis** (Sm.) D. Don

Epidendrum praecox Sm., *Exot. bot.* **2**: 73, t. 97 (1806).
Narainhetty, 30 October 1802 (Sheet 1404.24.1 LINN-SM, microfiche!-syntype).
= **Pleione praecox** (Sm.) D. Don
According to the protologue, Smith's epithet is based on a Buchanan-Hamilton specimen from 'Upper Nepal'. No other data is given.

Epidendrum teres Thunb., Buch.-Ham., in sched.
Narainhetty, 10 January 1803 (Sheet 1404.22 LINN-SM, microfiche!).

Habenaria uniflora D. Don, *Prodr. fl. nepal.*: 25 (1825).
Orchis uniflora Buch.-Ham., in sched.
'in Nepaliâ' [No original label]. (BM!-syntype). Narainhetty, 15 August 1802 (Sheet 1381.2.1 LINN-SM, microfiche!-syntype).
= **Pecteilis triflora** (D. Don) T. Tang & F.T. Wang

Limodorum asperifolium Buch.-Ham., in sched.
Narainhetty, 11 November 1802 (Sheet 1397.37 LINN-SM, microfiche!).

Limodorum lechmana Buch.-Ham., in sched.
Gorasan, 31 January 1802 (Sheet 1402.7 LINN-SM, microfiche!).

Malaxis cordifolia Sm. in Rees, *Cycl.* **22**: Malaxis n. 12 (1812), non *Liparis cordifolia* Hook.f. (1889).
Ophrys monophylla L., Buch.-Ham., in sched.
Narainhetty, 2 October 1802 (Sheet 1396.15 LINN-SM, microfiche!-syntype).
= **Liparis petiolata** (D. Don) P.F. Hunt & Summerh.

Malaxis ensiformis Sm. in Rees, *Cycl.* **22**: Malaxis n. 14 (1812).
Pinalia ensiformis Buch.-Ham., in sched.
Narainhetty, 30 November 1802 (Sheet 1396.11.1 LINN-SM, microfiche!-syntype?).
= **Oberonia ensiformis** (Sm.) Lindl.
In the protologue, Smith cites a Buchanan-Hamilton specimen dated 13 th November 1802. The only specimen at LINN matching the other protologue details is that cited above but which is dated 30 November 1802.

Malaxis lancifolia Sm. in Rees, *Cycl.* **22**: Malaxis n. 7 (1812).
Ophrys egaleata Buch.-Ham., in sched.
Suembu, 17 July 1802 (Sheet 1396.5 LINN-SM, microfiche!-syntype).
= **Liparis nervosa** (Thunb.) Lindl.

Malaxis latifolia Sm. in Rees, *Cycl.* **22**: Malaxis n. 3 (1812).
Pinalia trifida Buch.-Ham., in sched.
Narainhetty, 12 th August 1802 (Sheet 1396.3.1 LINN-SM, microfiche!-syntype).

Neottia flexuosa Sm. in Rees, *Cycl.* **24**: Neottia n. 9 (1813).
Ophrys spiralis Buch.-Ham., in sched.
Suembu, 1 May 1802 (Sheet 1389.3 LINN-SM microfiche!-syntype).
= **Spiranthes sinensis** (Pers.) Ames

Neottia parviflora Sm. in Rees, *Cycl.* **24**: Neottia n. 10 (1813).
Ophrys spiralis flore purpureo, Buch.-Ham., in sched.
Suembu, 23 July 1802 (Sheet 1389.4.1 LINN-SM, microfiche!-syntype).
= **Spiranthes sinensis** (Pers.) Ames

Octomeria spicata D. Don, *Prodr. fl. nepal.*: 31 (1825).
Pinalia alba Buch.-Ham., in sched.
Narainhetty, 15 August 1802 (BM!; Sheet 1396.16.1 LINN-SM, microfiche!-syntypes).
= **Eria spicata** (D. Don) Hand.-Mazz.

Ophrys alata L.f.?, Buch.-Ham., in sched.

Narainhetty, 1 September 1802 (Sheet 1386.21 LINN-SM, microfiche!).

Ophrys cernua L.?, Buch.-Ham., in sched.
Gorasan, 31 January 1802 (Sheet 1386.20 LINN-SM, microfiche!).

Ophrys sulcata Roxb., Buch.-Ham., in sched.
Gorasan, 31 January 1802 (Sheet 1386.22 LINN-SM, microfiche!).

Orchis bicornuta Buch.-Ham., in sched.
Narainhetty, 17 September 1802 (Sheet 1383.5.1 LINN-SM, microfiche!).

Orchis flexuosa L.f., Buch.-Ham., in sched.
Suembu, 17 July 1802 (Sheet 1381.98 LINN-SM, microfiche!).

Orchis gigantea Sm., *Exot. bot.* **2**: 79, t. 100 (1806).
'Upper Nepal' (Sheet LINN-SM, microfiche-syntype).
= **Pecteilis susannae** (L.) Raf.

Orchis obcordata [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 23 (1825), non Willem. (1796).
'in Napaliae alpibus' (BM!-syntype); Suembu, 23 July 1802 (Sheet 1381.86.1 LINN-SM, microfiche-syntype).
= **Brachycorythis obcordata** (Lindl.) Summerh.

Orchis pectinata [Buch.-Ham. ex] Sm., *Exot. bot.* **2**: 77, t. 99 (1805).
Secumbu, 18 July 1802 (Sheet 1381.22.1 LINN-SM, microfiche!-syntype).
= **Habenaria pectinata** D. Don

Satyrium latifolium Buch.-Ham., in sched.
Narainhetty, 5 August 1802 (Sheet 1381.97 LINN-SM, microfiche).

Stelis biflora Sm. in Rees, *Cycl.* **34**: Stelis n. 13 (1816).
'On the mossy banks of Upper Napaul'.
H. Hara in *Enum. fl. pl. Nepal* **1**: 56 (1978) noted that 'The application of this name is uncertain. There is no specimen in the Smith herbarium at the Linnean Society of London'.

Stelis hirta Sm. in Rees, *Cycl.* **34**: Stelis n. 11 (1816).
Sunipia hirta Buch.-Ham., in sched.
Narainhetty, 30 January 1803 (Sheet 1405.4 LINN-SM, microfiche!-syntype).
= **Bulbophyllum hirtum** (Sm.) Lindl. ex Wall.

Stelis mucronata D. Don, *Prodr. fl. nepal.*: 32 (1825).
Oberonia iridifolia Lindl., in Wall. (1829)
'in Nepaliâ' [No original label]. (BM!-syntype).
= **Oberonia ensiformis** (Sm.) Lindl.

Stelis odoratissima Sm. in Rees, *Cycl.* **34**: Stelis n. 12 (1816).
'Native of mossy rocks in Upper Nepaul'.
= **Bulbophyllum odoratissimum** (Sm.) Lindl. ex Wall.

Stelis racemosa Sm. in Rees, *Cycl.* **34**: Stelis n. 10 (1816).
'on trees in Upper Napaul'.
= **Sunipia racemosa** (Sm.) T. Tang & F.T. Wang

PALMAE

Elate bulbifera Buch.-Ham., in sched.
Baguanpur, 16 March 1802 (Sheet 1612.11 LINN-SM, microfiche!).
= **Phoenix** cf. **acaulis** Roxb.

PINACEAE

Pinus excelsa Wall. ex D. Don in Lamb, *Descr. Pinus* **2**: 5, t. 3 (1824), non Lam. (1779).
Pinus cembra L?, Buch.-Ham., in sched.
Narainhetty, 9 November 1802 (BM!-syntype).
= **Pinus wallichiana** A.B. Jacks.

PIPERACEAE

Piper guigual [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 20 (1825).
Narainhetty, 6 February 1803 (BM!-syntype).
= **Piper mullesua** [Buch.-Ham. ex] D. Don

Piper mullesua [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 20 (1825).
Narainhetty, 17 January 1803 (BM!-syntype).

Piper suipigua [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 20 (1825).
Narainhetty, 21 August 1802 (BM!-syntype).

PLANTAGINACEAE

Plantago erosa Wall., D. Don, *Prodr. fl. nepal.*: 77 (1825).
Plantago filiformis Buch.-Ham., in sched.
Suembu, 19 April 1802 (BM!).

POLYGALACEAE

Polygala arillata [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 199 (1825).
'in Nepaliâ ad Narainhetty. Floret Augusto'. (Syntype: specimen not found).

Polygala buchanani D. Don, *Prodr. fl. nepal.*: 199 (1825), nom. superfl.
Polygala monspeliaca Buch.-Ham., in sched.
Narainhetty, 1 September 1802 (BM!).
= **Polygala persicariifolia** DC.

Polygala crotalarioides [Buch.-Ham. ex] DC., *Prodr.* **1**: 327 (1824).
'in Napaliâ' [No original label]. (BM!-syntype).

Polygala discolor [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 199 (1825), nom. superfl.
'in Nepaliâ superiore' [No original label]. (BM!).
= **Polygala longifolia** Poir.

Polygala triphylla [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 200 (1825), non Burm.f. (1768).
Narainhetty, 1 September 1802 (BM!-syntype).
= **Polygala furcata** Royle

Salomonia petiolata in D. Don, *Prodr. fl. nepal.*: 200 (1825), nom. superfl.
'in Nepaliâ' [No original label]. (BM!).
= **Salomonia cantoniensis** Lour.

POLYGONACEAE

Coccoloba totnea [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 74 (1825).
'in Nepaliâ'. (Syntype: specimen not found).
= **Aconogonum molle** (D. Don) H. Hara

Polygonum capitatum [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 73 (1825).
'in Nepaliâ'. (Syntype: specimen not found).
= **Persicaria capitata** (D. Don) H. Gross

Polygonum dibotrys D. Don, *Prodr. fl. nepal.*: 73 (1825).
Polygonum fagopyrum Buch.-Ham., in sched.
'in Nepaliâ ad Narainhetty. Floret Septembri' (BM?-syntype). Material on loan: not seen.
= **Fagopyrum dibotrys** (D. Don) H. Hara

Polygonum posumbu [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 71 (1825).
'in Nepaliâ'. (Syntype: specimen not found).
= **Persicaria posumbu** (D. Don) H. Gross

Polygonum runcinatum [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 73 (1825).
'in Nepaliâ' (Syntype: specimen not found).
= **Persicaria runcinata** (D. Don) H. Gross

Polygonum viscosum [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 71 (1825).
'ad Suembu Nepaliae superioribus. Floret Aprili'. (Syntype: specimen not found).
= **Persicaria viscosa** (D. Don) Nakai

PRIMULACEAE

Anagallis alternifolia Buch.-Ham., in sched.
Sembu, 25 May 1802 (Sheet 284.11 LINN-SM, microfiche).

Anagallis caerulea L., Buch.-Ham., in sched.
Nepal, ann. 1802 (Sheet 284.7 LINN-SM, microfiche!).

Anagallis mauritiana Buch.-Ham., in sched.
Sembu, 11 June 1802 (Sheet 284.8.1 LINN-SM, microfiche); Nepal, 9 July 1802 (Sheet 284.8.2 LINN-SM, microfiche!).

Anagallis multiangularis Buch.-Ham. in Hook.f., *Fl. Brit. India.* **3**: 503 (1882), nom. nud. in syn.
Sembu, 26 May 1802 (Sheet 284.9 LINN-SM, microfiche!).
= **Lysimachia pyramidalis** Wall.

Anagallis teres Buch.-Ham., in sched.
Sembu, 18 May 1802 (Sheet 284.10 LINN-SM, microfiche!).

Androsace rotundifolia sensu Sm., *Exot. Bot.* **2**: 107, t. 113 (1806), non Hardw. (1795).
Androsace villosa? Buch.-Ham., in sched.
Narainhetty, 8 January 1802 (BM!-syntype); Nepal (Sheet 270.15 1 LINN-SM, microfiche-syntype).
= **Androsace umbellata** (Lour.) Merr.

Lysimachia secunda [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 84 (1825), nom. superfl.
Sembu, 5 June 1802 (BM!); Sembu, 2 June 1802 (Sheet 282.14 LINN-SM, microfiche!).
= **Lysimachia lobelioides** Wall.

Lysimachia tetragona D. Don, *Prodr. fl. nepal.*: 83 (1825), nom. superfl.
Lysimachia quinquangularis Buch.-Ham., in sched.
Narainhetty, 8 August 1802 (BM!).
= **Lysimachia alternifolia** Wall.

Lysimachia triangularis Buch.-Ham., in sched.
Sembu, 10 June 1802 (Sheet 282.15 LINN-SM, microfiche).

Primula denticulata Sm., *Exot. bot.* **2**: 109, t. 114 (1806).
Primula elata Buch.-Ham., in sched.
Chitlong, 10 April 1802 (Sheet 271.2.2 LINN-SM, microfiche!-syntype); Chitlong, 11 April 1802 (BM!-syntype); Narainhetty, 5 February 1803 (Sheet 271.2.1 LINN-SM, microfiche!-syntype).

Primula tridentata D. Don, *Prodr. fl. nepal.*: 77 (1825), nom. superfl.
Primula cushia Buch.-Ham., in sched.
Narainhetty, 10 February 1803 (BM! Sheet 271.13.1 LINN-SM, microfiche!); Narainhetty, 3 March 1803 (LINN microfiche!); source of the Bagmutty, Nepal, 28 December 1802 (Sheet 271.12.1 LINN-SM, microfiche!).
= **Primula petiolaris** Wall.
Wallich in Roxburgh, *Fl. ind.* **2**: 22 (1824), cites no specimen but states 'I have had frequent supplies of specimens of this very distinctive Primrose from the vicinity of Katumanda and from Gosain-Than'. It is possible that Buchanan's Narainhetty material could constitute part of these supplies.

RANUNCULACEAE

Anemone rivularis [Buch.-Ham. ex] DC., *Syst. nat.* **1**: 211 (1817).
Chitlong, 12 April 1802 (BM!; Sheet 972.40 LINN-SM, microfiche!-syntypes).
Anemone vitifolia [Buch.-Ham. ex] DC., *Syst. nat.* **1**: 211 (1817).
Sembu, 18 July 1802 (BM!; Sheet 972.39.2 LINN-SM, microfiche!-syntypes); Narainhetty, 1 September 1802 (Sheets 972.38 & 972.39.1 LINN-SM, microfiche!).
DeCandolle correctly cites the flowering time as July but gives the locality as Lamba. This is almost certainly a result of misreading Buchanan-Hamilton's handwritten Suembu.

Clematis acuminata DC., *Syst. nat.* **1**: 148 (1817).
Clematis trinervis Buch.-Ham., in sched.
Narainhetty, 31 December 1802 (BM!; Sheet 974.21 LINN-SM, microfiche!-syntypes).

Clematis buchananiana [Buch.-Ham. ex] DC., *Syst. nat.* **1**: 140 (1817).
Clematis bucamara Buch.-Ham., in sched.
Narainhetty, 30 October 1802 (BM!-syntype); Narainhetty, 26 October 1802 (Sheets 974.23 & 974.24 LINN-SM, microfiche!-syntype).
DeCandolle gives the locality as 'Harain-Hetty'.

Clematis grewiiflora DC., *Syst. nat.* **1**: 140 (1817), 'grewiaeflora'.
Clematis vitalba? Buch.-Ham., in sched.
Narainhetty, 27 November 1802 (BM!; Sheet 974.22 LINN-SM, microfiche!-syntypes); Narainhetty, 14 November 1802 (Sheet 974.26 LINN-SM, microfiche!-syntypes).

Clematis loasaefolia DC., *Syst. nat.* **1**: 140 (1817).
Clematis bucamara var. *loasaefolia* Buch.-Ham., in sched.
Narainhetty, 30 October 1802 (BM!-syntype); Narainhetty, 26 October 1802 (Sheet 974.27 LINN-SM, microfiche!-syntype).
= **Clematis grewiiflora** DC.
DeCandolle gives the locality as 'Harain-Hetty'.

Clematis montana [Buch.-Ham. ex] DC., *Syst. nat.* **1**: 164 (1817).
Clematis anemoniflora D. Don, *Prodr. fl. nepal.*: 192 (1825), nom. superfl.
Chitlong, 13 April 1802 (BM!-syntype?); Chitlong, 11 April 1802 (Sheet 974.25 LINN-SM, microfiche,-syntype?).

Clematis napaulensis DC., *Syst. nat.* **1**: 164 (1817).
Clematis diphylla Buch.-Ham., in sched.
'Napauliâ' [No original label]. (BM!-syntype?); Narainhetty, 2 February 1803 (Sheet 974.19 LINN-SM, microfiche!-syntype?); Narainhetty, 3 February 1803 (Sheet 974.20 LINN-SM, microfiche!-syntype?).
Clematis montana D. Don, *Prodr. fl. nepal.*: 192 (1825), nom. superfl.
Clematis montana var. *?* Buch.-Ham., in sched.
'in montanis ? Nepaliae' [No original label]. (BM!-syntype?).

Delphinium carela [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 195 (1825), nom. superfl.
Narainhetty, 10 August 1802 (Sheets 965.7 & 965.8 LINN-SM, microfiche!).
= **Delphinium scabriflorum** D. Don

Delphinium pauciflorum D. Don, *Prodr. fl. nepal.*: 196 (1825).
Delphinium consolida? Buch.-Ham., in sched.
Catmandu, 9 May 1802 (Sheet 965.5 LINN-SM, microfiche!-syntype); Narainhetty, 28 February 1803 (Sheet 965.6 LINN-SM, microfiche!-syntype).

Ranunculus indicus Roxb., Buch.-Ham., in sched.
Napaul, ann. 1802 (Sheet 987.23 LINN-SM, microfiche).
= **Ranunculus sceleratus** L.

Ranunculus sceleratus L., D. Don, *Prodr. fl. nepal.*: 195 (1825).
'in Nepaliae inundatis'. (Specimen not found).

Ranunculus ternatus Thunb., Buch.-Ham., in sched.
Chitlong, 11 April 1802 (Sheet 987.24 LINN-SM, microfiche!).

Ranunculus umbellatus Roxb., Buch.-Ham., in sched.
Ranunculus buchiana Buch.-Ham., in sched.
(BM!). No date or locality on original label.
= **Ranunculus sceleratus** L.

Thalictrum foliolosum DC., *Syst. nat.* **1**: 175 (1817).
Thalictrum dalingo Buch.-Ham., in sched.
Suembu, 1 May 1802 (BM!; Sheet 984.16 LINN-SM, microfiche!-syntypes); Suembu, 15 May 1802 (Sheet 984.17 LINN-SM, microfiche!-syntype).

Thalictrum rotundifolium DC., *Syst. nat.* **1**: 185 (1817).
Thalictrum batula Buch.-Ham., in sched.
(BM!-syntype) No date or locality on original label; Narainhetty, 10 August 1802 (Sheet 984.18 LINN-SM, microfiche!-syntype); Sembu, 21 July 1802 (Sheet 984.19 LINN-SM, microfiche!-syntype).

RHAMNACEAE

Hovenia dulcis sensu Roxb., *Fl. ind.* **2**: 414 (1824), non Thunb. (1798).
Narainhetty, 13 November 1802 (BM!).
= **Hovenia acerba** Lindl.

Roxburgh cites material introduced to the Calcutta Botanic Garden by Buchanan and collected on November 10and 14 1802, but not on November 13th.

Rhamnus trigynus D. Don, *Prodr. fl. nepal.*: 190 (1825), nom. superfl.
Rhamnus terminalis Buch.-Ham., in sched.
Narainhetty, 3 September 1802 & 10 September 1802 (BM!).
= **Sageretia filiformis** (Roth ex Schult.) G. Don

Rhamnus virgatus Roxb., *Fl. ind.* **2**: 351 (1824).
Rhamnus catharticus L.?, Buch.-Ham., in sched.
Sembu, 18 April 1802 (BM! synype?).
Roxburgh cites material grown from seeds introduced to the Calcutta Botanic Garden by Buchanan.

Zizyphus incurva Roxb., *Fl. ind.* **2**: 364 (1824).
Zizyphus paniculata Buch.-Ham., in sched.
Sembu, 18 May 1802 (BM!-syntype?).
Roxburgh cites material introduced to the Calcutta Botanic Garden by Buchanan.

ROSACEAE

Agrimonia nepalensis D. Don, *Prodr. fl. nepal.*: 229 (1825).
Agrimonia repens L.?, Buch.-Ham., in sched.
'in Nepaliâ'. (Syntype: specimen not found).
= **Agrimonia pilosa** var. **nepalensis** (D. Don) Nakai

Comarum flavum [Buch.-Ham. ex] Roxb., *Fl. ind. ed. 1832* **2**: 521 (1832).
Bassaria, 13 March 1802 (Sheet 908.3 LINN-SM, microfiche!).
= **Potentilla supina** L.

Cotoneaster affinis Lindl. in *Trans. Linn. Soc. London* **13**: 101 (1821).
Mespilus affinis (Lindl.) D. Don, *Prodr. fl. nepal.*: 238 (1825).
Crataegus cotoneaster Buch.-Ham., in sched.; *Mespilus integerrima* Buch.-Ham., in sched.
Chitlong, 14 April 1802; Chitlong, 15 April 1802 (BM!-syntypes).
Lindley mistakenly cites the locality as Chittong, a misreading of Buchanan-Hamilton's handwritten Chitlong.

Cydonia sumboshia [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 237 (1825).
Narainhetty, 11 March 1803 (BM!-syntype).
= **Cydonia oblonga** Mill.

Eriobotrya elliptica Lindl. in *Trans. Linn. Soc. London* **13**: 102 (1821).
Mespilus cuila [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 238 (1825), nom. superfl.
Narainhetty, 1 February 1803 (BM!-syntype).
= **Eriobotrya elliptica** Lindl.

Fragaria tuberosa Buch.-Ham., in sched.
Hettaura, Nepal, 1 April 1802 (Sheet 904.1 LINN-SM, microfiche!).

Mespilus tinctoria D. Don, *Prodr. fl. nepal.*: 238 (1825), nom. superfl.
Crataegus? shicola Buch.-Ham., in sched.
'ad Narainhetty Nepaliae. Floret Novembri'. (Specimen not found).
= **Eriobotrya dubia** (Lindl.) Decne.

Neillia thrysiflora D. Don, *Prodr. fl. nepal.*: 228 (1825).
'in Nepaliâ'. (Syntype: specimen not found).
Potentilla exarata Sm., in sched.; *Potentilla rupestris?* Buch.-Ham., in sched.
Suembu, 20 July 1802 (Sheet 903.8.1 LINN-SM, microfiche); Narainhetty, 8 August 1802 (Sheet 903.8.2 LINN-SM, microfiche).

Potentilla opaca L., Buch.-Ham., in sched.
Narainhetty, 6 March 1803 (Sheet 903.15 LINN-SM, microfiche).

Potentilla splendens Wall. ex D. Don, *Prodr. fl. nepal.*: 230 (1825).
Potentilla naspata Buch.-Ham., in sched.
'in Nepaliâ alpibus' [No original label]. (BM!-syntype).
[*Potentilla*] *rupestris?* Buch.-Ham., in sched.
Suembu (Sheet 903.59 LINN-SM, microfiche!).
= **Potentilla fulgens** Wall. ex Hook.

Potentilla verna L., Buch.-Ham., in sched.
Sembu, 15 July 1802 (Sheet 903.16 LINN-SM, microfiche!).

Prunus cerasoides D. Don, *Prodr. fl. nepal.*: 239 (1825).
Cerasus phoshia Buch.-Ham., in sched.
Narainhetty, 26 October 1802 (BM!-syntype).

Prunus undulata [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 239 (1825).
Narainhetty, 14 November 1802 (BM!-lectotype).
Lectotype designated by H. Hara in *J. Jap. Bot.* **48**: 97 (1973).

Pyrus crenata [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 237 (1825), non Lindl. (1835).
'ad Suembu Nepaliae superioribus. Floret Julio'. (Syntype: specimen not found).

Pyrus nussia [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 237 (1825).
Nilcunt, 26 April 1802 (BM!-syntype).
= **Stranvaesia nussia** (D. Don) Decne.

Pyrus pashia [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 236 (1825).
Narainhetty, 6 November 1802 (BM!-syntype); Narainhetty, 3 March 1803 (BM!-syntype).

Rosa brunonii Lindl., *Ros. monogr.*: 120, t. 14 (1820).
Rosa glutinosa Buch.-Ham., in sched.
Sambu, Nepalia, 18 April 1802 (BM!-syntype).

Rosa involucrata Roxb. ex Lindl., *Ros. monogr.*: 8 (1820).
Rosa palustris Buch.-Ham., in sched.
'in Nepaliâ' (BM!-syntype).
= **Rosa clinophylla** Thory
The original label gives the taxon name but no other data.

Rubus acuminatus Sm. in Rees, *Cycl.* **30**: Rubus n. 43 (1819).
Sembu, 4 July 1802 (Sheet 902.92 LINN-SM, microfiche!-syntype).

Rubus betulinus D. Don, *Prodr. fl. nepal.*: 233 (1825).
Rubus triflorus Buch.-Ham., in sched.
Sembu, 8 July 1802 (BM!-syntype).
= **Rubus acuminatus** Sm.

Rubus biflorus [Buch.-Ham. ex] Sm. in Rees, *Cycl.* **30**: Rubus n. 9 (1819).
Chitlong, Upper Napaul, 13 April 1802 (Sheet 902.66 LINN-SM, microfiche!-syntype).
H. Hara, in *Enum. fl. pl. Nepal* **2**: 144 (1979), noted that 'The type specimen differs from the common form of the species illustrated in *B. Mag.* t. 4678 in having smaller leaflets, smaller flowers, and densely pubescent calyces'.

Rubus ellipticus Sm. in Rees, *Cycl.* **30**: Rubus n. 16 (1819).
Rubus ishia Buch.-Ham., in sched.
Hettaura, stony banks of rivulets in Nepal, 9 April 1802 (Sheet 902.71 LINN-SM, microfiche!-syntype).
A second specimen, dated January 1802, is cited in the protologue but has not been located.

Rubus flavus [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 234 (1825).
Rubus parviflorus L., Buch.-Ham., in sched.; *Rubus ischia* Buch.-Ham., in sched.
Ethaura, 1 April 1802 (BM!-syntype).
= **Rubus ellipticus** Sm.

Rubus hamiltonianus Ser. in DC., *Prodr.* **2**: 566 (1825), p.p.
'ad Suembu Napaliae super' [No original label]. (BM!-syntype).
= **Rubus rugosus** Sm.

Rubus paniculatus Sm., in Rees, *Cycl.* **30**: Rubus n. 41 (1819).
Narainhetty, 18 November 1802 (Sheet 902.87 LINN-SM, microfiche!-syntype).

Rubus parvifolius sensu Sm. in Rees, *Cycl.* **30**: n. 21 (1819), non L. (1751).
Chittlang, 10 April 1802 (LBG no 7129 LIV-syntype); Nepaul (Sheet 902.72 LINN-SM, microfiche!-syntype?).
= **Rubus foliolosus** D. Don
Referring to specimens in the protologue Smith cites Chittlang, 10 April 1802 but also says 'we have . . . ones' implying there were several sheets.

Rubus pedunculosus D. Don, *Prodr. fl. nepal.*: 234 (1825).
Rubus biflorus? Buch.-Ham., in sched.
Chitlong, 10 April 1802 (BM!-syntype).
= **Rubus foliolosus** D. Don

Rubus rugosus Sm. in Rees, *Cycl.* **30**: Rubus n. 34 (1819).
Rubus rugosus [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 234 (1825), nom. superfl.
Rubus cumbata Buch.-Ham., in sched.
Narainhetty, 11 August 1802 (Sheet 902.88 LINN-SM, microfiche!); Sembu, 18 July 1802 (LBG no 7131 LIV-syntype); Suembu, 18 July 1802 (BM!-syntype).

Rubus tiliaceus Sm. in Rees, *Cycl.* **30**: Rubus n. 35 (1819).
Sembu, 2 June 1802 (Sheet 902.86 LINN-SM, microfiche!-syntype).
= **Rubus paniculatus** forma **tiliaceus** (Sm.) H. Hara

RUBIACEAE

Cuncea trifida [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 135 (1825).
Narainhetty, 11 August 1802 (BM!-syntype).
= **Knoxia sumatrensis** (Retz.) DC.

Galium ciliatum [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 133 (1825), non Ruiz & Pav. (1798).

Narainhetty, 6 August 1802 (BM!-syntype).
= **Galium hirtiflorum** Req. ex DC.

Galium latifolium [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 133 (1825).
Sembu, 15 July 1802 (BM!-syntype).
= **Galium elegans** Wall. ex Roxb.

Galium parviflorum D. Don, *Prodr. fl. nepal.*: 133 (1825).
Narainhetty, 7 August 1802 (BM!-syntype).
= **Galium asperifolium** Wall.

Gardenia rigida [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 138 (1825).
Suembu, 30 April 1802 (BM!-syntype).
= **Himalrandia tetrasperma** (Roxb.) T. Yamazaki

Hamiltonia scabra D. Don, *Prodr. fl. nepal.*: 137 (1825).
Hamiltonia dulina Buch.-Ham., in sched.; *Nonatellia? filamentosa* Buch.-Ham., in sched.
Narainhetty, 11 October 1802 (BM!-syntype).
= **Spermadictyon suaveolens** Roxb.

Hedyotis fusca [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 134 (1825), nom. superfl.
Gorasan, 16 February 1802 (BM!-syntype).
= **Kohautia gracilis** (Wall.) DC.

Hedyotis lineata Roxb., *Fl. ind.* **1**: 369 (1820).
Spermacoce lineata Buch.-Ham., in sched.
Narainhetty, 13 October 1802 (BM!).

Mussaenda hispida D. Don, *Prodr. fl. nepal.*: 139 (1825).
Mussaenda frondosa L.?, Buch.-Ham., in sched.
Narainhetty, 19 August 1802 (BM!-syntype).
= **Mussaenda macrophylla** Wall.

Mussaenda luculia [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 139 (1825), nom. superfl.
Narainhetty, 7 October 1802 (BM!).
= **Luculia gratissima** (Wall.) Sweet

Ophiorrhiza fasciculata D. Don, *Prodr. fl. nepal.*: 136 (1825).
Virecta fasciculata Buch.-Ham., in sched.
Suembu, 22 June 1802 (BM!-syntype).

Ophiorrhiza prostrata D. Don, *Prodr. fl. nepal.*: 136 (1825).
Virecta? prostrata Buch.-Ham., in sched.; *Virecta? suffruticosa* Buch.-Ham., in sched.
Narainhetty, 21 August 1802 (BM!-syntype).
= **Ophiorrhiza rugosa** Wall.
Don cites the flowering time as June. No specimen with this date has been located.

Randia triflora [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 138 (1825).
Hethaura, April 1802 (Syntype: specimen not found).
= **Fagerlindia fasciculata** (Roxb.) Tirveng.

Rondeletia coriacea Wall. in Roxb., D. Don, *Prodr. fl. nepal.*: 138 (1825).
Rondeletia asiatica L.?, Buch.-Ham., in sched.; *Rondeletia budda* Buch.-Ham., in sched.
Narainhetty, 23 February 1803 (BM!).
= **Wendlandia coriacea** (Wall.) DC.

Spermacoce pusilla Wall. in Roxb., D. Don, *Prodr. fl. nepal.*: 134 (1825).
'in Nepaliâ' [No original label]. (BM!).

RUTACEAE

Bergera integerrima [Buch.-Ham. ex] Colebr. in *Trans. Linn. Soc. London* **15**: 367 (1827).
Narainhetty, 4 March 1803 (BM!-syntype).
= **Micromelum integerrimum** (Colebr.) Wight & Arn. ex M. Roem.

SALICACEAE

Salix disperma [Roxb. ex] D. Don, *Prodr. fl. nepal.*: 58 (1825).
'in Nepaliâ'. (Syntype: specimen not found).
A. Kimura, *in Enum. fl. pl. Nepal* **3**: 218 (1982) cites *Wallich* 3700A as the lectotype of *S. disperma.*

Salix japonica sensu D. Don, *Prodr. fl. nepal.*: 59 (1825), non Thunb. (1784).
Narainhetty, 16 February 1803 (BM!).
= **Salix babylonica** L.

SANTALACEAE

Osyris chama Buch.-Ham., in sched.
Suembu, 15 May 1802 (Sheet 1518.4 LINN-SM, microfiche!).
= **Osyris wightiana** Wall. ex Wight

Viscum latifolium [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 142 (1825), non Lam. (1789).
Bimpedi Nepaliae, 8 April 1803 (BM!-syntype).
= **Dufrenoya platyphylla** (Spreng.) Stauffer

SAPOTACEAE

Bassia butyracea Roxb., Buch.-Ham., in sched.
Narainhetty, 9 November 1802 (Sheet 849.3 LINN-SM, microfiche!).
= **Diploknema butyracea** (Roxb.) H.J. Lam

Sideroxylon arboreum Buch.-Ham., in sched.
Narainhetty, 24 July 1803 (Sheet 382.7 LINN-SM, microfiche!).

SAURAUIACEAE

Ternstroemia racemosa D. Don, *Prodr. fl. nepal.*: 225 (1825), nom. superfl.
Dillenia racemosa Buch.-Ham., in sched.; *Tonshia polypetala* Buch.-Ham., in sched.
'ad Narainhetty Nepalensium. Floret Augusto' (BM!).
The original label gives the Buchanan-Hamilton manuscript names but no other data.
= **Saurauia napaulensis** DC.

SAXIFRAGACEAE

?*Thalictrum digynum*, Buch.-Ham., in sched.
Narainhetty, 30 August 1802 (Sheets 948.31 & 948.32 LINN-SM, microfiche!).

Astilbe rivularis [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 211 (1825).
'ad Narainhetty Nepalensium. Floret Septembri' (Specimen not found); Narainhetty, 14 October 1802 (Sheet 984.30 LINN-SM, microfiche!).
The specimen cited by Don ('Floret Septembri') has not been found.

Saxifraga ligulata Wall., D. Don, *Prodr. fl. nepal.*: 209 (1825).
Saxifraga pacumbis Buch.-Ham., in sched.
Narainhetty, 22 January 1803 (BM!).
= **Bergenia ciliata** forma **ligulata** Yeo
The specimen cited by Don ('Floret Martio') has not been found.

SCROPHULARIACEAE

Buchnera cruciata [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 91 (1825).
Narainhetty, 27 November 1802 (BM!-syntype).

Buchnera hispida [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 91 (1825).
Narainhetty, 21 October 1802 (BM!-syntype).

Centranthera nepalensis D. Don, *Prodr. fl. nepal.*: 88 (1825).
'in Nepaliâ' (Syntype: specimen not found).

Cybbanthera connata [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 87 (1825).
'in Nepaliâ ad Narainhetty. Floret Septembri'. (Syntype: specimen not found).
= **Limnophila connata** (D. Don) Hand.-Mazz.

Gmelina speciosissima D. Don, *Prodr. fl. nepal.*: 104 (1825).
Gmelina? tacabushia Buch.-Ham., in sched.
'in Nepaliâ' (BM!-syntype).
= **Wightia speciosissima** (D. Don) Merr.
The original label gives no date or locality data.

Gratiola cordifolia Vahl, D. Don, *Prodr. fl. nepal.*: 85 (1825).
'in Nepaliâ'. (Specimen not found).
= **Lindernia anagallis** (Burm.f.) Pennell

Rhinanthus bifidus [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 94 (1825).
'ad Narainhetty Nepalensium. Floret Septembri'. (Syntype: specimen not found).
= **Pedicularis bifida** (D. Don) Pennell

Sopubia trifida [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 88 (1825).
Manulea sopubia Buch.-Ham., in sched.
Sembu, 12 June 1802 (BM!-syntype).

Stemodia grandiflora [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 89 (1825).
'in Nepaliâ ad Narainhetty. Floret Octobri'. (Syntype: specimen not found).
= **Lindenbergia grandiflora** (D. Don) Benth.

Stemodia muraria Roxb. ex D. Don, *Prodr. fl. nepal.*: 89 (1825).
'in Nepaliâ'. (Syntype: specimen not found).
= **Lindenbergia indica** (L.) Vatke

Veronica punctata [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 93 (1825).
'ad Narainhetty Nepaliae, in scaturiginosis. Floret Novembri'. (Syntype: specimen not found).
= **Veronica undulata** Wall.

SIMAROUBACEAE

Simaba quassioides [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 248 (1825).
Nima quassioides Buch.-Ham., in sched.
Tancote, 16 April 1802 (BM!-syntype).
= **Picrasma quassioides** (D. Don) Benn.

SOLANACEAE

Physalis divaricata D. Don, *Prodr. fl. nepal.*: 97 (1825).
Physalis angulata (var.) Buch.-Ham., in sched.
'ad pagum Bassaria Nepalensibus dictum. Floret Martio'. (Syntype: specimen not found).

Solanum biflorum sensu D. Don, *Prodr. fl. nepal.*: 96 (1825), non Lour. (1790).
Solanum multifidum Buch.-Ham., in sched.
Narainhetty, 19 August 1802 (BM!).
= **Lycianthes macrodon** (Wall. ex Nees) Bitter

SYMPLOCACEAE

Symplocos crataegoides [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 145 (1825).
Palura odorata Buch.-Ham., in sched.
Tancote, 16 April 1802 (BM!-syntype).
= **Symplocos paniculata** (Thunb.) Miq.

Symplocos loha [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 144 (1825).
Symplocos subspinosa Buch.-Ham., in sched.
Narainhetty, 26 October 1802 (BM!-syntype); Narainhetty, 13 October 1802 (BM!-syntype); Narainhetty, 17 October 1802 (BM!-syntype).
= **Symplocos cochinchinensis** (Lour.) S. Moore

Symplocos sumuntia [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 145 (1825).
Narainhetty, 9 March 1802 (BM!-syntype).

Symplocos theifolia D. Don, *Prodr. fl. nepal.*: 145 (1825) 'theaefolia'.
Narainhetty, 3 November 1802 (BM!-syntype).
= **Symplocos lucida** (Thunb.) Siebold & Zucc.

THEACEAE

Camellia keina [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 224 (1825), nom. superfl.
Narainhetty, 9 August 1802 (BM!).
= **Camellia kissi** Wall.

Diospyros serrata [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 143 (1825).
Ternstroemia bifaria Buch.-Ham., in sched.
Narainhetty, 30 August 1802 (BM!-syntype).
= **Eurya acuminata** DC.

Gordonia chilaunea [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 225 (1825).
Suembu, 17 May 1802 (BM!-syntype).
= **Schima wallichii** (DC.) Korth.

Ternstroemia lushia [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 225 (1825), nom. superfl.
Suembu, 5 June 1802 (BM!-syntype).
= **Cleyera japonica** var. **wallichiana** (DC.) Sealy

THYMELAEACEAE

Dais bamutis Buch.-Ham., in sched.
Narainhetty, 27 January 1803 (Sheet 686.28 LINN-SM, microfiche).
= **Edgeworthia gardneri** (Wall.) Meisn.

Daphne bholua [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 68 (1825).
Daphne botlua Buch.-Ham., in sched.
Narainhetty, 25 January 1803 (BM!; Sheet 686.31 LINN-SM, microfiche!-syntypes).

Daphne cannabina Lour. ex Wall., *Asiat. Res.* **13**: 385 (1820).
Daphne odora sensu D. Don, *Prodr. fl. nepal.*: 68 (1825), non Thunb. (1784).
Daphne papyrifera [Buch.-Ham. ex] Meissn. in DC., *Prodr.* **14**: 537 (1857).
Narainhetty, 12 January 1803 (Sheet 686.30.1 LINN-SM, microfiche).
Chitlong, 12 April 1802 (Sheet 686.30.2 LINN-SM, microfiche).
= **Daphne papyracea** Wall. ex Steud.

Daphne sericea D. Don, *Prodr. fl. nepal.*: 69 (1825), non Vahl (1790).
Daphne oppositifolia Buch.-Ham., in sched.
Narainhetty, 13th August 1802 (BM! syntype; Sheet 686.35 LINN-SM, microfiche!-syntype).
= **Wikstroemia canescens** Meisn.

TILIACEAE

Grewia asiatica ?, Buch.-Ham., in sched.
Gorasan, 22 March 1802 (Sheet 1423.17 LINN-SM, microfiche!).
= **Grewia helicterifolia** Wall. ex G. Don

Grewia oppositifolia [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 227 (1825).
Sumbu, 18 May 1802 (Sheet 1423.16 LINN-SM, microfiche!-syntype).
= **Grewia optiva** J.R. Drumm. ex Burrett

Grewia pumila [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 227 (1825).
Grewia hirsuta W?, Buch.-Ham., in sched.
Bassaria (Sheet 1423.18 LINN-SM, microfiche!-syntype).
= **Grewia sapida** Roxb. ex DC.

Triumfetta annua L., D. Don, *Prodr. fl. nepal.*: 227 (1825).
Narainhetty, 17 August 1802 (Sheet 863.7 LINN-SM, microfiche!).

Triumfetta oblonga Hornem. ex Schrank. in *Syll. Pl. Nov.* **1**: 213 (1824); [Wall ex] D. Don, *Prodr. fl. nepal.*: 227 (1825), nom. superfl.
Narainhetty, 29 September 1802 (Sheet 863.6 LINN-SM, microfiche!).
= **Triumfetta pilosa** Roth

UMBELLIFERAE

Bupleurum tenue [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 182 (1825), non Salisb. (1796).
Narainhetty, 8 September 1802 (BM!-syntype).
= **Bupleurum hamiltonii** N.P. Balakr.
This specimen is also a type of *B. hamiltonii* N.P. Balakr. in *J. Bombay Nat. Hist. Soc.* **63**: 328 (1967).

Hydrocotyle hispida [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 182 (1825), nom. superfl.
'in Nepaliâ' [No original label]. (BM-syntype).
= **Hydrocotyle nepalensis** Hook.

Hydrocotyle tenella D. Don, *Prodr. fl. nepal.*: 183 (1825).
'in Nepaliâ'. (Syntype: specimen not found).
= **Hydrocotyle sibthorpioides** Lam.

Pimpinella anethifolia D. Don, *Prodr. fl. nepal.*: 184 (1825).
'ad Narainhetty Nepalensium'. (Syntype: specimen not found).
= **Trachyspermum anethifolium** (D. Don) H. Wolff

Sanicula elata [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 183 (1825).
Narainhetty, 18 November 1802 (BM!-syntype).

Sanicula hermaphrodita [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 183 (1825).
Suembu, 1 July 1802 (BM!-syntype).
= **Sanicula elata** [Buch.-Ham. ex] D. Don

URTICACEAE

Boehmeria frutescens sensu D. Don, *Prodr. fl. nepal.*: 59 (1825), non Thunb. (1784).
Urtica frutescens Thunb., Buch.-Ham., in sched.
Sembu, 23 July 1802 (BM!).
= **Maoutia puya** (Hook.) Wedd.

Boehmeria macrophylla D. Don, *Prodr. fl. nepal.*: 60 (1825), non Hornem (1815), nom. superfl.
Urtica angustifolia Buch.-Ham., in sched.
Narainhetty, 5 September 1802 (BM!-lectotype).
Lectotype designated by D.G. Long in Notes Roy. Bot. Gard. Edinburgh ***40****: 130 (1982).*
= **Boehmeria penduliflora** [Wedd. ex] D.G. Long

Boehmeria nana D. Don, *Prodr. fl. nepal.*: 60 (1825).
Urtica nana Buch.-Ham., in sched.
Narainhetty, 21 October 1802 (BM!-syntype).
= **Pouzolzia zeylanica** (L.) Benn. & R. Br.

Boehmeria platyphylla D. Don, *Prodr. fl. nepal.*: 60 (1825).
Urtica platyphylla Buch.-Ham., in sched.
Narainhetty, 3 September 1802 (BM!-syntype).
= **Boehmeria macrophylla** Hornem.

Boehmeria rotundifolia D. Don, *Prodr. fl. nepal.*: 60 (1825).
Urtica rotundifolia Buch.-Ham., in sched.
Sembu, 23 July 1802 (BM!-syntype).
= **Boehmeria macrophylla** Hornem.

Boehmeria salicifolia D. Don, *Prodr. fl. nepal.*: 60 (1825).
Urtica arbuscula Buch.-Ham., in sched.
Chisa Pany Hill (BM!-syntype).
Determined as *Debrageasia saeneb* (Forssk.) Hepper & Wood by C. Wilmott-Dear in 1987 and indicated on the sheet by her as the syntype of *B. salicifolia* D. Don.
= **Debregeasia salicifolia** (D. Don) Rendle

Boehmeria ternifolia D. Don, *Prodr. fl. nepal.*: 59 (1825).
Urtica ternifolia Buch.-Ham., in sched.
'in Nepaliâ' [No original label]. (BM!-syntype).

Procris monandra [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 61 (1825).
'in Nepaliâ' [No original label]. (BM!-syntype).
= **Elatostema monandrum** (D. Don) H. Hara

Procris punctata [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 61 (1825).
Procris docum Buch.-Ham., in sched.
Sembu, 23 July 1802 (BM!-syntype).
= **Elatostema sessile** var. **polycephalum** Wedd.

Procris rupestris [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 60 (1825).
'in Nepaliâ. Floret Julio' [No original label]. (BM!-syntype).
= **Elatostema rupestre** (D. Don) Wedd.

Urtica scripta [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 59 (1825).
Narainhetty, 8 August 1802 (BM!-syntype);
Narainhetty, 22 September 1802 (BM!).
= **Pilea scripta** (D. Don) Wedd.

VERBENACEAE

Clerodendrum foetidum D. Don, *Prodr. fl. nepal.*: 103 (1825).
Volkameria foetida Buch.-Ham., in sched.
Narainhetty, 20 March 1803 (BM!-syntype).
= **Caryopteris foetida** (D. Don) Thell.

Clerodendrum odoratum D. Don, *Prodr. fl. nepal.*: 102 (1825).
Volkameria odorata Buch.-Ham., in sched.
'ad Gorasan Nepalensium. Floret Februario'. (Syntype: specimen not found).
= **Caryopteris bicolor** (Hardwicke) Mabberley
Don also cites Roxburgh, *Hort. bengal.*: 46 (1814), who lists a Buchanan-Hamilton specimen collected in Nepal in 1802.

Clerodendrum serratum (L.) Moon, D. Don, *Prodr. fl. nepal.*: 103 (1825).
Volkameria serrata L., Buch.-Ham., in sched?
'in Nepaliâ. Floret Septembri'. (Specimen not found).

Clerodendrum verticillatum [Roxb. ex] D. Don, *Prodr. fl. nepal.*: 102 (1825).
'in Nepaliâ'. (Syntype?: specimen not found).
= **Clerodendrum indicum** (L.) Kuntze

Verbena sororia [Roxb. ex] D. Don, *Prodr. fl. nepal.*: 104 (1825), nom. superfl.
Verbena officinalis Buch.-Ham., in sched.
Bassaria, 7 March 1802 (BM!).
= **Verbena officinalis** L.
Don also cites Roxburgh, *Hort. bengal.*: 4 (1814), who lists a Buchanan-Hamilton specimen collected in Nepal in 1802.

VIOLACEAE

Viola caespitosa D. Don, *Prodr. fl. nepal.*: 205 (1825), nom. superfl.
Viola patrinii var. *napaulensis* DC., *Prodr.* **1**: 293 (1824).
Viola primulifolia Buch.-Ham., in sched., non L.
Chitlong, 12 April 1802 (BM! syntype of *Viola patrinii* var. *napaulensis* DC. and *V. caespitosa*).
= **Viola betonicifolia** Sm. subsp. **betonicifolia**

Viola hamiltoniana D. Don, *Prodr. fl. nepal.*: 206 (1825).
'in Nepaliâ' [No original label]. (BM!-syntype)
Cited as lectotype by H. Hara in *Enum. fl. pl. Nepal* **2**: 47 (1979).

Viola palmaris [Buch.-Ham. ex] DC., *Prodr.* **1**: 298 (1824).
Bimpedi, 8 April 1802 (BM!-syntype).
= **Viola pilosa** Blume

VITACEAE

Vitis purani [Buch.-Ham. ex] D. Don, *Prodr. fl. nepal.*: 188 (1825).
Tancot, 15 April 1802 (BM!-syntype).
= **Vitis parvifolia** Roxb.

ZINGIBERACEAE

Globba racemosa Sm., *Exot. bot.* **2**: 115, t. 117 (1808).
Hedychoum deosara Buch.-Ham., in sched.
Suembu, 28 June 1802 (Sheet 67.5.1 LINN-SM, microfiche!-syntype).

Hedychium coccineum [Buch.-Ham. ex] Sm. in Rees, *Cycl.* **17**: Hedychium n. 5 (1811).
Suembu, 8 June 1802 (Sheet 8.22 LINN-SM, microfiche!-syntype).

Hedychium gandasulium Buch.-Ham. in Hook. in *Hooker's J. Bot. Kew Gard. Misc.* **5**: 325 (1853), nom. nud. in syn.
Narainhetty, 2 September 1802 (Sheet 8.37 LINN-SM, microfiche!).
= **Hedychium coronarium** J. Koenig

Hedychium ellipticum Sm. in Rees, *Cycl.* **17**: Hedychium n. 2 (1811).
Narainhetty, 26 July 1802 (Sheet 8.31 LINN-SM, microfiche!-syntype).

Hedychium spicatum Sm., in Rees, *Cycl.* **17**: Hedychium n. 3 (1811).
Narainhetty, 10 August 1802 (Sheet 8.27 LINN-SM, microfiche!-syntype).

Hedychium thyrsiforme Sm. in Rees, *Cycl.* **17**: Hedychium n. 4 (1811).
Narainhetty, 21 August 1802 (Sheet 8.34 LINN-SM, microfiche!-syntype).

Roscoea purpurea Sm., *Exot. bot.* **2**: 97, t. 108 (1806).
Narainhetty, 8 August 1802 (Sheet 9.2.1 LINN-SM, microfiche!-syntype).
In the protologue Smith mentions a Buchanan-Hamilton drawing and specimens, suggesting he saw several sheets; only one has been located.

Localities of collections by Buchanan-Hamilton in Nepal (1802–3)

(Present-day names, if different, are given in parentheses.)

Bagmutty (Bagmati River)
Baguanpur (Makwanpur)
Bassaria
Bimpedi (Bhimphedi)
Bheempedi (Bhimphedi)

Catmandu (Kathmandu)
Chisa Pany Hill (Chisapani)
Chisapani
Chisapany (Chisapani)
Chitlong (Chitlang)
Chittlang (Chitlang)
Chittong (Chitlang)
Churiaghant hills (Churia hills)
Culi Khana (Kulekhani)

Ethaura (Hetaunda)
Ettaura (Hetaunda)

Gorasaan (Gorasan)
Gorasan

Harain-Hetty (Narayanhiti)
Harain-Netty (Narayanhiti)
Hethaura (Hetaunda)
Hettaura (Hetaunda)
Hettaurei (Hetaunda)

Kargoo
Katmandu (Kathmandu)
Kuli Khana (Kulekhani)

Lamba (Swayambhu)
Lohiar

Muking

Narainhetty (Narayanhiti)
Nilcunt (Budanilkantha)
Norcotera

Pherphing (Pharping)

Sambu (Swayambhu)
Secumbu (Swayambhu)
Sembu (Swayambhu)
Suembu (Swayambhu)
Suemby (Swayambhu)

Tancot (Thankot)
Tancote (Thankot)
Terriany forest (Terai forest)
Tomba Cana (Tombu Cana)
Tombha Cana (Tombu Cana)
Tombu Cana

Unpublished material relating to Buchanan-Hamilton's collections

There is various unpublished material relating to Buchanan-Hamilton's Nepalese collections, including letters, manuscripts and drawings. These form part of the large volume of material given by Buchanan-Hamilton to J.E. Smith in 1805 and are held in the library of the Linnean Society in London. They are listed here, with information taken from the Linnean Society library catalogue.

1. *Letters of . . . F. Buchanan (afterwards Hamilton) addressed to . . . W. Roxburgh. 1795–1812.* Typescript: 165 leaves. There is an unnumbered leaf between ff. 76 & 77.

2. *Flora Nepalensis.* 1802–1803. 168 leaves. Incomplete Flora of Nepal, commencing with cryptogams and terminating with Lysimachiae, made in 1802–1803 and based on collections taken chiefly near Kathmandu. Presented to J.E. Smith in 1805 together with Nepal Buchanan-Hamilton's herbarium. Accompanied by a typescript note on the Flora by A.H.G. Alston, 1945.

3. *Plantarum Nepalensium Icones Pictae.* No date. Large folio of 182 sheets of water-colour drawings by native artists, mostly with Buchanan-Hamilton determinations in ink and some in pencil (by J.E. Smith?). (Title taken from original wrapper). cf. Buchanan-Hamilton's manuscript *Flora Nepalensis* which cites some of these drawings.

4. *Water colour drawings of Indian plants.* No date. Large folio of 95 sheets of water-colour drawings of Indian plants, numbered vii to ci, by native artists, with Buchanan-Hamilton determinations in ink and some pencilled determinations (by J.E. Smith?). cf. Buchanan-Hamilton's *Animalium et Plantarum descriptiones* which cites some of these drawings.

5. *Catalogue of dried plants.* c. 1822. Folio. Catalogue of Buchanan-Hamilton's collections presented to the Museum of the Honourable. East Iindia Company, and arranged according to the system of Linnaeus (Ff. 193), & Herbarii Heyneani enumeration (Ff. 30). Fair copies of original mss dates 1822.

6. *Manuscript notes on Indian plants.* No date. c. 400 sheets in a quarto box. Field notes relating to the years 1802–1803 and lists of seeds sent to Dr Roxburgh & Co. Each leaf has the place and date on it with 3 different index numbers at the head, pro J.E. Smith.

7. *Index slips.* 1802–1803. Several hundred slips in a quarto box, each with plant name and 3 different index numbers at the head. They probably relate to the field notes on Indian plants.

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INDEX

Caryophyllaceae 106
Caryopteris bicolor (Hardwicke) Mabberly 124
Caryopteris foetida (D. Don) Thell. 124
Cassia dimidiata [Buch.-Ham. ex] D. Don 111
Cassia mimosoides subsp. lechenaultiana (DC.) H. Ohashi 111
Castanopsis tribuloides (Sm.) A. DC. 109
Celastraceae 106
Centranthera nepalensis D. Don 122
Cerastium fontanum subsp. grandiflorum (D. Don) H. Hara 106
Cerastium grandiflorum [Buch.-Ham. ex] D. Don 106
Cerasus phoshia Buch.-Ham. 120
Ceropegia candelabrum L. 105
Chaptalia maxima D. Don 107
Chlorophytum nepalense (Lindl.) Baker 113
Chonemorpha fragrans (Moon) Alston 104
Cineraria denudata Buch.-Ham. 108
Cinnamomum cathia D. Don 111
Cinnamomum tomentosum D. Don 111
Cirsium verutum (D. Don) Spreng. 107
Cissampelopsis buimala (D. Don) C. Jeffrey & Y.L. Chen 108
Cissampelos angulata Buch.-Ham. 114
Cissampelos bahapo Buch.-Ham. 114
Cissampelos hirsuta [Buch.-Ham. ex] DC. 114
Cissampelos pareira var. hirsuta (DC.) Forman 114
Clematis acuminata DC. 118
Clematis anemoniflora D. Don 119
Clematis bucamara Buch.-Ham. 118
Clematis bucamara var. *loasaefolia* Buch.-Ham. 118
Clematis buchananiana [Buch.-Ham. ex] DC. 118
Clematis diphylla Buch.-Ham. 119
Clematis grewiiflora DC. 118
Clematis loasaefolia DC. 118
Clematis montana [Buch.-Ham. ex] DC. 119
Clematis montana D. Don 119
Clematis montana var. *?* Buch.-Ham. 119
Clematis napaulensis DC. 119
Clematis trinervis Buch.-Ham. 118
Clematis vitalba? Buch.-Ham. 118
Clerodendrum foetidum D. Don 124
Clerodendrum indicum (L.) Kuntze 124
Clerodendrum odoratum D. Don 124
Clerodendrum serratum (L.) Moon 124
Clerodendrum verticillatum [Roxb. ex] D. Don 124
Cleyera japonica var. wallichiana (DC.) Sealy 123
Clinopodium piperitum (D. Don) Murata 111
Clinopodium repens Buch.-Ham. 111
Clinopodium umbrosum (M. Bieb.) K. Koch 111
Cnicus verutus D. Don 107
Coccoloba totnea [Buch.-Ham. ex] D. Don 117
Colebrookea oppositifolia Sm. 110
Comarum flavum [Buch.-Ham. ex] Roxb. 119
Combretaceae 106
Combretum nanum [Buch.-Ham. ex] D. Don 106
Combretum spicatum Buch.-Ham. 106
Combretum? appendiculatum Buch.-Ham. 106
Commelina hispida Buch.-Ham. 107
Commelina obliqua [Buch.-Ham. ex] D. Don 107
Commelina paludosa Blume 107
Commelinaceae 107
Compositae 107
Convallariaceae 113
Convolvulaceae 108
Conyza alata Buch.-Ham. 107
Conyza cappa [Buch.-Ham. ex] D. Don 107
Conyza falcata [Buch.-Ham. ex] Spreng. 107
Conyza falcata Buch.-Ham. 107
Conyza leucantha (D. Don) Ludlow & P.H. Raven 107
Conyza leucanthemea Buch.-Ham. 107
Conyza stricta var. pinnatifida (D. Don) Kitam. 107
Conyza trifida Buch.-Ham. 107
Conyza? cappa Buch.-Ham. 107
Cordiaceae 108
Cornaceae 108
Cornus oblonga Wall. 108
Cornus paniculata Buch.-Ham. 108
Coronilla stipulata Buch.-Ham. 111
Cotoneaster affinis Lindl. 119
Crataegus cotoneaster Buch.-Ham. 119
Crataegus? shicola Buch.-Ham. 119
Crotalaria ?cytissoides Buch.-Ham. 112
Crotalaria alata [Buch.-Ham. ex] D. Don 111
Crotalaria albida [Heyne ex] Roth 111
Crotalaria anthylloides Lam. 111
Crotalaria ciliata Buch.-Ham. 112
Crotalaria cytisoides Roxb. ex DC. 112
Crotalaria humifusa Benth. 112
Crotalaria linifolia sensu D. Don, non L.f. 111
Crotalaria pilosa Buch.-Ham. 111
Crotalaria polygalifolia Buch.-Ham. 111
Crotalaria prostrata Buch.-Ham. 111
Crotalaria prostrata sensu D. Don 112
Crotalaria psoralioides D. Don, non Lam. 112
Crotalaria salicifolia Buch.-Ham. 111
Crotalaria sessiliflora L. 111
Crotalaria tuberosa [Buch.-Ham. ex] D. Don 112
Cruciferae 108
Cuncea trifida [Buch.-Ham. ex] D. Don 120
Cupressaceae 108
Cyananchus foetidum Buch.-Ham. 105
Cybbanthera connata [Buch.-Ham. ex] D. Don 122
Cyclobalanopsis glauca (Thunb.) Oerst. 109
Cyclobalanopsis lamellosa (Sm.) Oerst. 109
Cydonia oblonga Mill. 119
Cydonia sumboshia [Buch.-Ham. ex] D. Don 119
Cynoglossum prostratum [Buch.-Ham. ex] D. Don 106
Cyperaceae 108

Dais bamutis Buch.-Ham. 123
Dalbergia sericea G. Don 112
Daphne bholua [Buch.-Ham. ex] D. Don 123
Daphne botlua Buch.-Ham. 123
Daphne cannabina Lour. ex Wall. 123
Daphne odora sensu D. Don, non Thunb. 123
Daphne oppositifolia Buch.-Ham. 123
Daphne papyracea Wall. ex Steud. 123
Daphne papyrifera [Buch.-Ham. ex] Meissn. 123
Daphne sericea D. Don, non Vahl 123
Datisca cannabina L. 108
Datisca nepalensis D. Don 108
Datiscaceae 108
Debrageasia saeneb (Forssk.) Hepper & Wood 124
Debregeasia salicifolia (D. Don) Rendle 124
Delphinium carela [Buch.-Ham. ex] D. Don 119
Delphinium consolida? Buch.-Ham. 119
Delphinium pauciflorum D. Don 119
Delphinium scabriflorum D. Don 119
Desmodium concinnum var. retusum (D. Don) H. Ohashi 112
Desmodium confertum DC. 112
Desmodium microphyllum (Thunb.) DC. 112
Desmodium multiflorum DC. 112
Dillenia racemosa Buch.-Ham. 121
Dinetus racemosus (Wall.) Sweet 108
Dioscorea bulbifera L. 108
Dioscorea obtusangula Buch.-Ham. 108
Dioscorea pisiformis Buch.-Ham. 108
Dioscoreaceae 108
Diospyros serrata [Buch.-Ham. ex] D. Don 122
Diploknema butyracea (Roxb.) H.J. Lam 121
Disporum cantoniense var. parviflorum (Wall.) H. Hara 112
Disporum pitsutum D. Don 112
Dobinea vulgaris [Buch.-Ham. ex] D. Don 104
Drosera lunata [Buch.-Ham. ex] DC. 108
Drosera peltata var. lunata (DC.) C.B. Clarke 108
Droseraceae 108
Dufrenoya platyphylla (Spreng.) Stauffer 121
Duhaldea cappa (D. Don) Anderberg 107

Echites fragrans Buch.-Ham. 104
Echites tomentosa Buch.-Ham. 104
Echites triangularis Buch.-Ham. 104
Edgeworthia gardneri (Wall.) Meisn. 123
Ehretia laevis Roxb. 108
Elaeagnaceae 108
Elaeagnus arborea Roxb. 108
Elaeagnus armata Buch.-Ham. 108
Elaeagnus infundibularis Momiy. 108
Elaeagnus parvifolia Wall. ex Royle 108
Elaeagnus umbellata Thunb. 108
Elaeagnus umbellatus Thunb. 108
Elate bulbifera Buch.-Ham. 117
Elatostema monandrum (D. Don) H. Hara 124
Elatostema rupestre (D. Don) Wedd. 124
Elatostema sessile var. polycephalum Wedd. 124
Eleocharis congesta D. Don 108
Elsholtzia blanda (Benth.) Benth. 110
Elsholtzia fruticosa (D. Don) Rehder 110
Elsholtzia stachyodes (Link) Raizada & Saxena 110
Embelia esculenta D. Don 114
Embelia floribunda Wall. 114
Embelia nagushia D. Don 114
Embelia vestita Roxb. 114
Epidendrum angustifolium Swartz 116
Epidendrum bifarium Swartz 116
Epidendrum calceolare Buch.-Ham. 115
Epidendrum cuybua Buch.-Ham. 116
Epidendrum damun-sultea Buch.-Ham. 116
Epidendrum gemellum Buch.-Ham. 116
Epidendrum geniculatum Buch.-Ham. 116
Epidendrum hippium Buch.-Ham. 116
Epidendrum humile Sm. 116
Epidendrum praecox Sm. 116
Epidendrum teres Thunb. 116
Epilobium brevifolium D. Don 115
Epilobium montanum L. 115
Eria spicata (D. Don) Hand.-Mazz. 116
Ericaceae 108
Erigeron alatum [Roxb. ex] D. Don 107
Erigeron falcatum D. Don 107
Erigeron hieracifolium D. Don 107
Erigeron leucanthum D. Don 107
Erigeron pinnatifidum [Roxb. ex] D. Don 107
Eriobotrya dubia (Lindl.) Decne. 119
Eriobotrya elliptica Lindl. 119
Eriophorum comosum (Wall.) Wall. ex C.B. Clarke 108
Eriosema himalaicum H. Ohashi 112
Eulophia bicallosa (D. Don) P.F. Hunt & Summerh. 116
Eulophia dabia (D. Don) Hochr. 116
Euonymus grandiflorus Wall. 106
Euonymus lacerus [Buch.-Ham. ex] D. Don 106
Euonymus madana Buch.-Ham. 106
Eupatorium acuminatum D. Don 107
Eupatorium bhuibu Buch.-Ham. 107
Eupatorium bhuibu? Buch.-Ham. 107
Eupatorium pyramidale D. Don 107
Euphorbia angustifolia [Buch.-Ham. ex] D. Don 109
Euphorbia dracunculoides Lam. 109
Euphorbia fusiformis [Buch.-Ham. ex] D. Don 109
Euphorbia parviflora L. 109
Euphorbia prolifera [Buch.-Ham. ex] D. Don 109
Euphorbia tenuis [Buch.-Ham. ex] D. Don 109
Euphorbiaceae 109
Eurya acuminata DC. 122
Exacum tetragonum Roxb. 109

Fagaceae 109
Fagerlindia fasciculata (Roxb.) Tirveng. 121
Fagopyrum dibotrys (D. Don) H. Hara 118
Ficus cabur [Buch.-Ham. ex] Sm. 114
Ficus citrifolia? Roxb. 114
Ficus cunea Buch.-Ham. 114
Ficus infrafoliacea [Buch.-Ham. ex] Sm. 114
Ficus neriifolia Sm. 114
Ficus pilashi Sm. 114
Ficus sarmentosa [Buch.-Ham. ex] Sm. 114
Ficus sarmentosa Sm. 114
Ficus semicordata [Buch.-Ham. ex] Sm. 114
Ficus subincisa [Buch.-Ham. ex] Sm. 114

Ficus virens Ait. 114
Ficus virens var. sublanceolata (Miq.) Corner 114
Fimbristylis dichotoma (L.) Vahl 108
Fimbristylis diphylla (Retz.) Vahl 108
Flacourtia 109
Flacourtia infrafoliacea Buch.-Ham. 109
Flacourtia sepiaria Roxb. 109
Flacourtiaceae 109
Floscopa scandens Lour. 107
Fragaria tuberosa Buch.-Ham. 119

Galium asperifolium Wall. 121
Galium ciliatum [Buch.-Ham. ex] D. Don, non Ruiz & Pav. 120
Galium elegans Wall. ex Roxb. 121
Galium hirtiflorum Req. ex DC. 121
Galium latifolium [Buch.-Ham. ex] D. Don 121
Galium parviflorum D. Don 121
Gardenia rigida [Buch.-Ham. ex] D. Don 121
Gastrochilus calceolaris (Sm.) D. Don 115
Gastrochilus dasypogon (Sm.) O. Kuntze 115
Gaultheria fragrans D. Don 109
Gaultheria fragrantissima Wall. 109
Gaultheria nummularioides D. Don 109
Genista juasi Buch.-Ham. 112
Gentiana capitata [Buch.-Ham. ex] D. Don 109
Gentiana decemfida [Buch.-Ham. ex] D. Don 109
Gentianaceae 109
Geraniaceae 110
Geranium nepalense Sweet 110
Geranium quinquenerve Buch.-Ham. 110
Gerbera maxima (D. Don) Beauverd 107
Germanea coetsa Buch.-Ham. 110
Globba racemosa Sm. 124
Glycine proscimum Buch.-Ham. 112
Gmelina speciosissima D. Don 122
Gmelina? tacabushia Buch.-Ham. 122
Gnaphalium busua [Buch.-Ham. ex] D. Don 107
Gnaphalium busua Buch.-Ham. 107
Gnaphalium contortum Buch.-Ham. 107
Gnaphalium quintuplinerve Buch.-Ham. 107
Gnaphalium timmua Buch.-Ham. 107
Gordonia chilaunea [Buch.-Ham. ex] D. Don 123
Gratiola cordifolia Vahl 122
Grewia asiatica ?, Buch.-Ham. 123
Grewia helicterifolia Wall. ex G. Don 123
Grewia hirsuta W?, Buch.-Ham. 123
Grewia oppositifolia [Buch.-Ham. ex] D. Don 123
Grewia optiva J.R. Drumm. ex Burrett 123
Grewia pumila [Buch.-Ham. ex] D. Don 123
Grewia sapida Roxb. ex DC. 123
Guttiferae 110
Gynura bicolor (Willd.) DC. 107

Habenaria pectinata D. Don 117
Habenaria uniflora D. Don 116
Hamiltonia dulina Buch.-Ham. 121
Hamiltonia scabra D. Don 121
Hedera aculeata [Buch.-Ham. ex] D. Don 105
Hedera elata [Buch.-Ham. ex] D. Don 105
Hedera hainla [Buch.-Ham. ex] D. Don 105
Hedera helix sensu D. Don, non L. 105
Hedera nepalensis K. Koch 105
Hedera parasitica [Buch.-Ham. ex] D. Don 105
Hedera tomentosa [Buch.-Ham. ex] D. Don 105
Hedychium coccineum [Buch.-Ham. ex] Sm. 124
Hedychium coronarium J. Koenig 124
Hedychium ellipticum Sm. 124
Hedychium gandasulium Buch.-Ham. 124
Hedychium spicatum Sm. 124
Hedychium thyrsiforme Sm. 124
Hedychoum deosara Buch.-Ham. 124
Hedyotis fusca [Buch.-Ham. ex] D. Don 121
Hedyotis lineata Roxb. 121
Hedysarum alhagi L. 112
Hedysarum dioicum [Buch.-Ham. ex] D. Don 112
Hedysarum junceum L.f. 111
Hedysarum retusum [Buch.-Ham. ex] D. Don 112
Hedysarum sambuense D. Don 112
Hedysarum suembum Buch.-Ham. 112
Hedysarum tenellum [Buch.-Ham. ex] D. Don 112
Heliotropium obovatum [Roxb. ex] D. Don 106
Heliotropium ovalifolium Forssk. 106
Himalrandia tetrasperma (Roxb.) T. Yamazaki 121
Hovenia acerba Lindl. 119
Hovenia dulcis sensu Roxb., non Thunb. 119
Hydrangea aspera [Buch.-Ham. ex] D. Don 110
Hydrangeaceae 110
Hydrocotyle hispida [Buch.-Ham. ex] D. Don 123
Hydrocotyle nepalensis Hook. 123
Hydrocotyle sibthorpioides Lam. 123
Hydrocotyle tenella D. Don 123
Hypericum bracteatum [Buch.-Ham. ex] D. Don 110
Hypericum cordifolium Choisy 110
Hypericum dichotomum Buch.-Ham. 110
Hypericum elodeoides Choisy 110
Hypericum japonicum Thunb. 110
Hypericum lungusum Buch.-Ham. 110
Hypericum nervosum D. Don 110
Hypericum uralum [Buch.-Ham. ex] D. Don 110

Ilex dipyrena Wall. 105
Ilex excelsa (Wall.) Hook.f. 105
Ilex odorata [Buch.-Ham. ex] D. Don 105
Ilex rotunda sensu D. Don, non Thunb. 105
Ilex saysia Buch.-Ham. 105
Impatiens insignis DC. 105
Impatiens leptoceras DC. 105
Impatiens odorata D. Don 105
Impatiens racemosa D. Don 105
Indigofera atropurpurea [Buch.-Ham. ex] D. Don 112
Indigofera atropurpurea [Buch.-Ham. ex] Hornem. 112
Indigofera dosua [Buch.-Ham. ex] D. Don 112
Indigofera trifoliata L. 112
Isodon coetsa (D. Don) Kudô 110
Isodon ternifolius (D. Don) Kudô 110

Jasminum arboreum Buch.-Ham. 115
Jasminum dichotomum D. Don, non Vahl 115
Jasminum dispermum Wall. 115
Jasminum heterophyllum Roxb. 115
Jasminum latifolium Buch.-Ham. 115
Jasminum multiflorum (Burm.f.) Andrews 115
Jasminum nepalense Spreng. 115
Jasminum pubescens (Retz.) Willd. 115
Jasminum subhumile W.W. Sm. 115
Juniperus chinensis? Buch.-Ham. 108
Juniperus indica Bertol. 108
Juniperus recurva [Buch.-Ham. ex] D. Don 108

Knoxia sumatrensis (Retz.) DC. 120
Kohautia gracilis (Wall.) DC. 121

Labiatae 110
Laggera alata (D. Don) Sch. Bip. ex Oliv. 107
Lauraceae 111
Laurus cathia Buch.-Ham. 111
Laurus cuipala Buch.-Ham. 111
Laurus cuneata Buch.-Ham. 111
Laurus cuspidata D. Don 111
Laurus gushia Buch.-Ham. 111
Laurus jacaricata Buch.-Ham. 111
Laurus nacusua D. Don 111
Laurus nancushia Buch.-Ham. 111
Laurus tomentosa Buch.-Ham. 111
Laurus umbellata [Buch.-Ham. ex] D. Don, non Thunb. 111
Laurus? lateralis Buch.-Ham. 111
Lavendula ternifolia Buch.-Ham. 110
Leguminosae 111
Lentibulariaceae 112
Leontia fruticosa Buch.-Ham. 105
Lepidagathis incurva [Buch.-Ham. ex] D. Don 104
Lespedeza juncea var. sericea (Thunb.) F.B. Forbes & Hemsl. 111
Liatris latifolia D. Don 107
Ligustrum bracteolatum D. Don 115
Ligustrum nepalense Wall. 115
Ligustrum spicatum [Buch.-Ham. ex] D Don 115
Ligustrum? japonicum? Buch.-Ham. 115
Liliaceae 112
Liliaceae s.l. 112
Lilium batisua Buch.-Ham. 112
Lilium japonicum Thunb. 112
Lilium wallichianum Schult. & Schult.f. 113
Limnophila connata (D. Don) Hand.-Mazz. 122
Limodorum asperifolium Buch.-Ham. 116
Limodorum bicallosum Buch.-Ham. 116
Limodorum dabia Buch.-Ham. 116
Limodorum graminifolium Buch.-Ham. 116
Limodorum lechmana Buch.-Ham. 116
Linaceae 113
Lindenbergia grandiflora (D. Don) Benth. 122
Lindenbergia indica (L.) Vatke 122
Lindera melastomacea (Nees) Villar 111
Lindera nacusua (D. Don) Merr. 111
Lindernia anagallis (Burm.f.) Pennell 122
Linum cicanobum [Buch.-Ham. ex] D. Don 113
Linum repens [Buch.-Ham. ex] D. Don 113
Linum semitrigynum Buch.-Ham. 113
Liparis cordifolia Hook.f. 116
Liparis nervosa (Thunb.) Lindl. 116
Liparis petiolata (D. Don) P.F. Hunt & Summerh. 116
Lithocarpus grandifolius var. brevipetiolatus (A.DC.) S.N. Biswas 109
Litsea doshia (D. Don) Kosterm. 111
Lobelia begonifolia Wall. 106
Lobelia heyneana Roem. & Schult. 106
Lobelia obliqua Buch.-Ham. 106
Lobelia pyramidalis Wall. 106
Lobelia rosea Wall. 106
Lobelia secundei? Buch.-Ham. 106
Lobelia stimulans Buch.-Ham. 106
Lobelia trialata [Buch.-Ham. ex] D. Don 106
Loganiaceae 113
Lonicera ligustrina Wall. 107
Lonicera macrantha (D. Don) Spreng. 107
Loranthaceae 113
Loranthus hexapetala Buch.-Ham. 113
Loranthus odoratus Wall. 113
Luculia gratissima (Wall.) Sweet 121
Lycianthes macrodon (Wall. ex Nees) Bitter 122
Lyonia ovalifolia (Wall.) Drude 109
Lysimachia alternifolia Wall. 118
Lysimachia lobelioides Wall. 118
Lysimachia pyramidalis Wall. 118
Lysimachia quinquangularis Buch.-Ham. 118
Lysimachia secunda [Buch.-Ham. ex] D. Don 118
Lysimachia tetragona D. Don 118
Lysimachia triangularis Buch.-Ham. 118
Lythraceae 113

Maesa chisia [Buch.-Ham. ex] D. Don 114
Maesa macrophylla (Wall.) A. DC. 115
Maesa tomentosa D. Don 115
Maesa viridiflora Buch.-Ham. 115
Magnoliaceae 113
Mahonia napaulensis DC. 105
Malaxis cordifolia Sm. 116
Malaxis ensiformis Sm. 116
Malaxis lancifolia Sm. 116
Malaxis latifolia Sm. 116
Malucona communis Buch.-Ham. 109
Malucona communis? Buch.-Ham. 109
Manglilla? Buch.-Ham. 115
Manglilla bilrhi Buch.-Ham. 115
Manna nepalensis D. Don 112
Manulea sopubia Buch.-Ham. 122
Maoutia puya (Hook.) Wedd. 123
Marrubium piperitum Buch.-Ham. 111
Melastoma chulese Buch.-Ham. 114
Melastoma humile Buch.-Ham. 114
Melastoma normale D. Don 114
Melastoma stellatum Buch.-Ham. 114

Rosa palustris Buch.-Ham. 120
Rosaceae 119
Roscoea purpurea Sm. 124
Rotala rotundifolia (D. Don) Koehne 113
Rotala rubra (D. Don) H. Hara 113
Rubiaceae 120
Rubus acuminatus Sm. 120
Rubus betulinus D. Don 120
Rubus biflorus [Buch.-Ham. ex] Sm. 120
Rubus cumbata Buch.-Ham. 120
Rubus ellipticus Sm. 120
Rubus flavus [Buch.-Ham. ex] D. Don 120
Rubus foliolosus D. Don 120
Rubus hamiltonianus Ser. 120
Rubus ishia Buch.-Ham. 120
Rubus paniculatus forma tiliaceus (Sm.) H. Hara 120
Rubus paniculatus Sm. 120
Rubus parviflorus L. 120
Rubus parvifolius sensu Sm., non L. 120
Rubus pedunculosus D. Don 120
Rubus rugosus [Buch.-Ham. ex] D. Don 120
Rubus rugosus Sm. 120
Rubus tiliaceus Sm. 120
Rubus triflorus Buch.-Ham. 120
Ruellia capitata [Buch.-Ham. ex] D. Don 104
Ruellia recurva Buch.-Ham. 104
Rutaceae 121

Sageretia filiformis (Roth ex Schult.) G. Don 119
Sagittaria guyanensis subsp. lappula (D. Don) Bogin 104
Sagittaria lappula D. Don 104
Salicaceae 121
Salix babylonica L. 121
Salix disperma [Roxb. ex] D. Don 121
Salix japonica sensu D. Don 121
Salomonia cantoniensis Lour. 117
Salomonia petiolata in D. Don 117
Samara sessilis Buch.-Ham. 115
Samara? esculenta Buch.-Ham. 114
Samara? nagushia Buch.-Ham. 114
Samara? potama Buch.-Ham. 115
Samara? subspinosa Buch.-Ham. 115
Sanicula elata [Buch.-Ham. ex] D. Don 123
Sanicula hermaphrodita [Buch.-Ham. ex] D. Don 123
Santalaceae 121
Sapotaceae 121
Satyrium latifolium Buch.-Ham. 117
Saurauia napaulensis DC. 121
Saurauiaceae 121
Saxifraga ligulata Wall. 122
Saxifraga pacumbis Buch.-Ham. 122
Saxifragaceae 121
Schefflera elata (D. Don) Harms 105
Schefflera impressa (C.B. Clarke) Harms 105
Schima wallichii (DC.) Korth. 123
Schoepfia fragrans Wall. 115
Scirpus congestus Buch.-Ham. 108
Scirpus elongatus [Buch.-Ham. ex] D. Don 108
Scrophulariaceae 122
Scutellaria albida? Buch.-Ham. 110
Scutellaria discolor Colebr. 110
Scutellaria indica sensu D. Don, non L. 110
Scutellaria repens [Buch.-Ham. ex] D. Don 110
Scutellaria scandens [Buch.-Ham. ex] D. Don 110
Selago? oppositifolia Buch.-Ham. 110
Senecio 3-ligulata Buch.-Ham. 108
Senecio buimalia [Buch.-Ham. ex] D. Don 107
Senecio cappa [Buch.-Ham. ex] D. Don 108
Senecio cappa Buch.-Ham. 108
Senecio chrysanthemoides DC. 108
Senecio denudata D. Don 108
Senecio jacobaea L. 108
Senecio musuca Buch.-Ham. 108
Senecio nudicaulis [Buch.-Ham. ex] D. Don 108
Senecio triligulatus [Buch.-Ham. ex] D. Don 108
Sideroxylon arboreum Buch.-Ham. 121
Simaba quassioides [Buch.-Ham. ex] D. Don 122
Simaroubaceae 122
Smilacaceae 113
Smilax aspera L. 113
Smilax capitata Buch.-Ham. 113
Smilax columnifera Buch.-Ham. 113
Smilax maculata [Roxb. ex] D. Don 113
Smilax ovalifolia [Roxb. ex] D. Don 113
Solanaceae 122
Solanum biflorum sensu D. Don 122
Solanum multifidum Buch.-Ham. 122
Sopubia trifida [Buch.-Ham. ex] D. Don 122
Spermacoce lineata Buch.-Ham. 121
Spermacoce pusilla Wall. 121
Spermadictyon suaveolens Roxb. 121
Spiranthes sinensis (Pers.) Ames 116
Stelis biflora Sm. 117
Stelis hirta Sm. 117
Stelis mucronata D. Don 117
Stelis odoratissima Sm. 117
Stelis racemosa Sm. 117
Stellaria monosperma [Buch.-Ham. ex] D. Don 106
Stellaria saccurcunda Buch.-Ham. 106
Stellaria saxatilis [Buch.-Ham. ex] D. Don 106
Stellaria vestita Kurz 106
Stemodia grandiflora [Buch.-Ham. ex] D. Don 122
Stemodia muraria Roxb. ex D. Don 122
Stranvaesia nussia (D. Don) Decne. 120
Strobilanthes pentastemonoides (Nees) T. Anderson 104
Sultea elatior Buch.-Ham. 113
Sultea humilior Buch.-Ham. 113
Sunipia hirta Buch.-Ham. 117
Sunipia racemosa (Sm.) T. Tang & F.T. Wang 117
Swertia angustifolia [Buch.-Ham. ex] D. Don 109
Swertia ciliata (G. Don) B.L. Burtt 110
Swertia quadriculata Buch.-Ham. 110
Swida oblonga (Wall.) Soják 108
Symphoricarpos ?odoratus Buch.-Ham. 115
Symplocaceae 122
Symplocos cochinchinensis (Lour.) S. Moore 122
Symplocos crataegoides [Buch.-Ham. ex] D. Don 122
Symplocos loha [Buch.-Ham. ex] D. Don 122
Symplocos lucida (Thunb.) Siebold & Zucc. 122
Symplocos paniculata (Thunb.) Miq. 122
Symplocos subspinosa Buch.-Ham. 122
Symplocos sumuntia [Buch.-Ham. ex] D. Don 122
Symplocos theifolia D. Don 122
Synotis cappa (D. Don) C. Jeffrey & Y.L. Chen 108
Synotis triligulata (D. Don) C. Jeffrey & Y.L. Chen 108

Ternstroemia bifaria Buch.-Ham. 122
Ternstroemia lushia [Buch.-Ham. ex] D. Don 123
Ternstroemia racemosa D. Don 121
Tetranthera cuipala [Buch.-Ham. ex] D. Don 111
Tetranthera doshia D. Don 111
Teucrium laxum D. Don 111
Teucrium quadrifarium [Buch.-Ham. ex] D. Don 111
Thalictrum batula Buch.-Ham. 119
Thalictrum dalingo Buch.-Ham. 119
?*Thalictrum digynum*, Buch.-Ham. 121
Thalictrum foliolosum DC. 119
Thalictrum rotundifolium DC. 119
Theaceae 122
Thymelaeaceae 123
Thymus piperitus D. Don 111
Thymus repens D. Don 111
Tiliaceae 123
Tomex ?lampatia Buch.-Ham. 111
Tomex bolo Buch.-Ham. 111
Tomex doshia Buch.-Ham. 111
Tonshia polypetala Buch.-Ham. 121
Trachelospermum lucidum (D. Don) K. Schum. 104
Trachyspermum anethifolium (D. Don) H. Wolff 123
Trilliaceae 113
Triumfetta annua L. 123
Triumfetta oblonga Hornem. ex Schrank. 123
Triumfetta pilosa Roth 123
Tupistra aurantica ([Wall. ex] Baker) Hook.f. 113

Umbelliferae 123
Urtica angustifolia Buch.-Ham. 123
Urtica arbuscula Buch.-Ham. 124
Urtica frutescens Thunb. 123
Urtica nana Buch.-Ham. 123
Urtica platyphylla Buch.-Ham. 123
Urtica rotundifolia Buch.-Ham. 123
Urtica scripta [Buch.-Ham. ex] D. Don 124
Urtica ternifolia Buch.-Ham. 124
Urticaceae 123
Utricularia aurea Lour. 112
Utricularia confervaefolia [Jackson ex] D. Don 112
Utricularia vulgaris Buch.-Ham. 112
Uvularia pitsutu Buch.-Ham. 112
Uvulariaceae 112

Vallaris solanacea (Roth) O. Kuntze 104
Verbena officinalis Buch.-Ham. 124
Verbena officinalis L. 124
Verbena sororia [Roxb. ex] D. Don 124
Verbenaceae 124
Vernonia aspera Buch.-Ham. 107
Vernonia extensa DC. 107
Veronica punctata [Buch.-Ham. ex] D. Don 122
Veronica undulata Wall. 122
Viburnum cylindricum [Buch.-Ham. ex] D. Don 106
Viburnum dichotomum Buch.-Ham. 113
Viburnum lantana? Buch.-Ham. 106
Viburnum mullaha [Buch.-Ham. ex] D. Don 106
Viburnum punctatum [Buch.-Ham. ex] D. Don 106
Viola betonicifolia Sm. subsp. betonicifolia 124
Viola caespitosa D. Don 124
Viola hamiltoniana D. Don 124
Viola palmaris [Buch.-Ham. ex] DC. 124
Viola patrinii var. *napaulensis* DC. 124
Viola pilosa Blume 124
Viola primulifolia Buch.-Ham. 124
Violaceae 124
Virecta fasciculata Buch.-Ham. 121
Virecta? prostrata Buch.-Ham. 121
Virecta? suffruticosa Buch.-Ham. 121
Viscum album L. 113
Viscum articulatum Burm.f. 113
Viscum dichotomum D. Don 113
Viscum latifolium [Buch.-Ham. ex] D. Don 121
Viscum stellatum [Buch.-Ham. ex] D. Don 113
Vitaceae 124
Vitis parvifolia Roxb. 124
Vitis purani [Buch.-Ham. ex] D. Don 124
Volkameria foetida Buch.-Ham. 124
Volkameria odorata Buch.-Ham. 124
Volkameria serrata L. 124

Wendlandia coriacea (Wall.) DC. 121
Wightia speciosissima (D. Don) Merr. 122
Wikstroemia canescens Meisn. 123

Xylosteon naisoca Buch.-Ham. 106
Xylosteum ligustrinum (Wall.) D. Don 106
Xylosteum scandens Buch.-Ham. 106

Zingiberaceae 124
Zizyphus incurva Roxb. 119
Zizyphus paniculata Buch.-Ham. 119
Zoduba masuca Buch.-Ham. 116

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