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THE SYSTEMATICS OF THE GENUS *AMAUROPELTA* (PTERIDOPHYTA: THELYPTERIDACEAE) IN THE CARIBBEAN ISLANDS

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THE SYSTEMATICS OF THE GENUS *AMAUROPELTA* (PTERIDOPHYTA: THELYPTERIDACEAE) IN THE CARIBBEAN ISLANDS

VOLUME I

By

Orlando Alvarez-Fuentes

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ABSTRACT

THE SYSTEMATICS OF THE GENUS *AMAUROPELTA* (PTERIDOPHYTA: THELYPTERIDACEAE) IN THE CARIBBEAN ISLANDS

By

Orlando Alvarez-Fuentes

Thelypteris subgenus *Amauropelta* comprises at least 200 fern species. Most of them occur in the Neotropics, but there are about 11 paleotropical species. My studies with Caribbean amauropeltoid species propose improvements to the taxonomy of Thelypteridaceae that help resolve a long standing controversy about generic classification in the family. Plastid DNA regions (*rps4*, the *rps4-trnS* spacer, and the *trnL-trnF* spacer) were analyzed to infer the phylogeny and evaluate the phylogenetic position of *Thelypteris* subg. *Amauropelta*, building on earlier phylogenetic work. The results of my molecular phylogenetic trees show strong support for the monophyly of subg. *Amauropelta* and highlight that our best approach towards a classification of the family would require recognition of *Thelypteris* in a narrow sense, as well as recognition of many additional genera. The resulting phylogeny, however, did not provide adequate resolution to fully clarify relationships among the sections of *Thelypteris* subg. *Amauropelta*, but it does provide insight that some sections are not monophyletic, e.g., *Amauropelta*, *Uncinella*, *Lepidoneuron*, and *Adenophyllum*. This study proposes recognizing subgenus *Amauropelta* at generic level; for that reason it was necessary to make 51 new combinations to *Amauropelta* for the Caribbean species and some continental American ones. A taxonomic treatment focuses on the Caribbean species of the genus and is based mainly on herbarium studies, SEM studies of spore morphology,

and field observations. Of the Neotropical *Amauropelta*, 57 taxa occur in the Caribbean Islands (50 species and 7 varieties), of which 41 are endemic to the area. These high levels of endemism parallel those reported for flowering plant taxa in the Caribbean region. Five of those Caribbean amauropeltoid taxa (3 species and 2 varieties) and a section are described here. The taxonomic treatment of the 57 taxa includes keys to species identification, general distribution data, and illustrations. Furthermore, my studies based on museum specimens deposited in herbaria across the world and my fieldwork in the Caribbean Islands have resulted in the revision of 15 taxa (14 species and one variety) of *Amauropelta* sect. *Uncinella* for the area. Within *Amauropelta*, species of sect. *Uncinella* are clearly diagnosable by its uncinate or hamate hairs in laminar tissue and vascular axes. This regional revision, which also includes taxonomic keys and species descriptions, documents the current diversity of the Caribbean species of *Amauropelta* sect. *Uncinella*. In this study, *A. consimilis* was excluded from the synonymy of *A. gracilis* and revalidated as a good taxon and *A. oligocarpa* var. *navarrensis* is recognized at the varietal rank. In addition, the taxonomic confusion that persisted about the specific epithet '*diplazioides*' was resolved.

Hemos soñado el mundo y estamos ya cerca para vivirlo a plenitud. El sueño, este sueño de corto plazo, es ya nuestra realidad; otros sueños vendrán, lo sé, y volveremos a crecernos mientras encuentro refugio en tí, y volverás a alimentarme, y a alzarme, y a derretir la nieve con tu sonrisa, y así, lograrás que me dedique a volver a conquistar el mundo ... por tí

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KEY TO ABBREVIATIONS

Most abbreviations follow Stearn (2004).

al.	*alii*, others
comb. nov.	*combinatio nova*, a nomenclatural new combination
nom. illeg.	*nomen illegitimum*, an illegitimate name
s.l.	*sensu lato*, in a broad sense
s.s.	*sensu stricto*, in a narrow sense
sect.	section
sp. nov.	*species novus*, a new species
subg.	subgenus
var.	variety
var. nov.	*varietus novus*, a new variety

CHAPTER 1

THE GENUS *AMAUROPELTA* (THELYPTERIDACEAE) IN THE CARIBBEAN ISLANDS: INTRODUCTION

The fern family Thelypteridaceae Pic. Serm. is a large, worldwide group of nearly 1,000 species with a complex taxonomic history. This family has been a subject of controversy regarding generic boundaries for more than 50 years. There are two views concerning the best way to circumscribe genera within the family: most New World fern specialists recognize only one to five genera while most Old World specialists recognize about thirty (see below for a more full discussion). One of the goals of this dissertation is to provide a framework that will address this dual classification system in Thelypteridaceae; for that purpose I selected to cover in this study those fern species of *Thelypteris* subgenus *Amauropelta* (Kunze) A.R. Sm. in the Caribbean Islands.

The Caribbean Islands, as defined here (Figure 1), are formed by three major archipelagos that extend in an arc from the Yucatan Peninsula and southern Florida to the northern coast of South America, and delimited the Caribbean Sea from the Atlantic Ocean (Santiago-Valentin & Olmstead 2004; Fritsch & McDowell 2003; Gutiérrez & Rivero 2002). These three archipelagos are: The Bahamas; the Greater Antilles, which includes the largest islands in the Caribbean region: Cuba, Hispaniola, Puerto Rico, and Jamaica; and the Lesser Antilles, an arc of smaller islands that extend from Sombrero, east of Puerto Rico and the Anegada Passage, to Grenada, north of Venezuela (Acevedo-Rodriguez 2007).

As in most islands, the Caribbean biota is distinguishing by high levels of species richness and endemicity; these topics have driven much interest in island biology and have resulted in numerous and important studies in ecology, evolution, and systematics (e.g., Darwin 1859; MacArthur & Wilson 1967; Carlquist 1974 and citations therein;

Crawford & al. 1987; Adsersen 1995; Crawford & Stuessy 1997; Futuyma 1998; Francisco-Ortega & al. 2000).

Estimates of species richness of vascular plants in the Caribbean Islands are between 12,000 and 13,000 species, of which about 60% are endemic to the islands (Fritsch & McDowell 2003, and citations therein). This places the Caribbean Islands as one of the leading biodiversity hotspots in the world (Myers & al. 2000; Smith & al. 2004; Francisco-Ortega & al. 2007). The high plant diversity observed in the Caribbean is explained by many factors such as proximity to continental America, diversity of topography and substrates; tropical climatic conditions; and complex geology (Samek 1973; Borhidi 1996).

Thelypteris subgenus *Amauropelta* is recognized here as genus *Amauropelta* Kunze in Chapters 3, 4, 5, and 6. *Amauropelta* is the genus with the most fern taxa in the Caribbean with 57 taxa (50 species and 7 varieties), of which 41 are endemic to the area. These high levels of endemism parallel those reported for flowering plant taxa in the Caribbean region (Santiago-Valentin & Olmstead 2004; Francisco-Ortega & al. 2007).

Recent work in Caribbean *Amauropelta* has shown that important gaps remain in our knowledge of its taxonomy (at least in the Caribbean area), evolutionary history, distribution, and conservation status (Alvarez-Fuentes 1995; Alvarez-Fuentes & Sánchez 2005a; Sánchez & Caluff 2005). The most complete taxonomic treatments of *Amauropelta* (as *Thelypteris* subg. *Amauropelta*) in the Caribbean are those of Proctor covering the Lesser Antilles (1977), Jamaica (1985a), and Puerto Rico and the Virgin Islands (1989), and more recently Sánchez & al. (2006) covering Thelypteridaceae for Cuba. These treatments document the species in the islands but they are not inclusive and provide little information about species relationships in the Caribbean, or about the relationships with thelypteroid species outside the Caribbean area. Moreover, there is no modern account for *any* fern family from Hispaniola.

With this in view I decided to pursue a comprehensive study covering all Caribbean species of *Amauropelta,* including a phylogenetic framework to improve the taxonomy and reach a better understanding of their evolutionary relationships and biogeography.

In Chapter 2, a molecular-based phylogeny is presented to further test the monophyly of *Thelypteris* subg. *Amauropelta.* These results allow me to examine the two taxonomic views concerning the best way to circumscribe genera within Thelypteridaceae, concluding that our best approach towards a stable classification of the family would require recognition of *Thelypteris* in a narrow sense and to recognize *Amauropelta* at the generic rank.

A consequence of the recognition of *Amauropelta* is that new combinations for many species are necessary. The rules of the ICBN, the International Code of Botanical Nomenclature, establish that a new combination is only validly published if the basionym or replaced synonym is cited (McNeill et al. 2006). Forty-three new combinations to *Amauropelta* for the Caribbean and some continental American species are made in Chapter 3 to facilitate future discussions in the text.

In Chapter 4, a taxonomic treatment for all the 57 Caribbean taxa of *Amauropelta* is presented; the treatment includes keys, general distribution data, and illustrations. Six new taxa, including a new section, are described here and eight new sectional combinations are presented.

Chapter 5 comprises a detailed taxonomic revision of the 15 Caribbean taxa of *Amauropelta* sect. *Uncinella* (A.R. Sm.) J.P. Roux. This section was selected as a study case because: 1) their species are characterized by the presence of uncinate or hamate hairs in laminar tissue and/or vascular axes, 2) the 15 taxa of *Uncinella* that occur in the Caribbean represent 26% of all Caribbean amauropeltoid taxa; and 3) they are distributed in most islands of the Caribbean area.

Chapter 6 summarizes the limitations of the present study and points to the best way to resolve them in future studies. In this chapter I also present what I think should be the future directions in the study of Thelypteridaceae worldwide and future research goals related to the systematics, evolution and biogeography of *Amauropelta*.

Figure 1. Map of the Caribbean Islands including part of Florida, Central America, and part of South America. Both Haiti and the Dominican Republic (Dom. Rep.) are part of the island Hispaniola. Map was modified from those generated by the Cartographic Research Lab of the University of Alabama (http://alabamamaps.ua.edu/).

Produced by the Cartographic Research Lab
University of Alabama

CHAPTER 2

PHYLOGENETIC ANALYSIS OF *THELYPTERIS* SUBGENUS *AMAUROPELTA* (THELYPTERIDACEAE) BASED ON PLASTID DNA SEQUENCES

ABSTRACT

Plastid DNA regions (*rps4*, the *rps4-trnS* spacer, and the *trnL-trnF* spacer) were analyzed to infer the phylogeny and evaluate the phylogenetic position of *Thelypteris* subg. *Amauropelta*, building on earlier phylogenetic work. This group is a large, mainly Neotropical group with about 200 species. The inferred phylogeny provides strong support for the monophyly of subg. *Amauropelta* and illustrates even more the need for a new, and cohesive, classification system for Thelypteridaceae. Thelypteridaceae is a large, worldwide group of nearly 1,000 species of ferns with a complex taxonomic history. Generic circumscriptions in the family have been a subject of controversy for more than 50 years. There are two views concerning the best way to circumscribe genera within the family: most New World fern specialists recognize only one to five genera while most Old World specialists recognize about thirty. The resulting phylogeny suggests that the best approach towards a stable classification of the family would require recognition of *Thelypteris* in a narrow sense and to recognize *Amauropelta* at the generic rank. Consequentially other groups sometimes treated within *Thelypteris* would merit generic recognition as well (e.g., *Coryphopteris* Holttum, *Metathelypteris* (H. Itô) Ching, *Oreopteris* Holub, and *Parathelypteris* (H. Itô) Ching). The phylogeny, however, did not provide adequate resolution to fully clarify relationships among the sections of *Thelypteris* subg. *Amauropelta*, but it does provide insight that some sections are not monophyletic, e.g., *Amauropelta*, *Uncinella*, *Lepidoneuron*, and *Adenophyllum*.

INTRODUCTION

Our current understanding of evolutionary relationships of ferns (monilophytes) has greatly benefited from a number of phylogenetic studies in the last fifteen years (Hasebe & al. 1994, 1995; Pryer & al. 1995, 2001a, 2004; Wolf & al. 1998; Schneider & al. 2004a; Smith & al. 2006; Schuettpelz & Pryer 2007). Several studies within the leptosporangiate fern lineages have resulted in a phylogenetic framework to address long-standing questions about classification in many families, e.g., Aspleniaceae Newman (Van den Heede & al. 2003; Schneider & al. 2004b), Cyatheaceae Kaulf. (Korall & al. 2006, 2007), Dryopteridaceae Ching (Little & Barrington 2003; Skog & al. 2004; Geiger & Ranker 2005), Grammitidaceae Ching (Ranker & al. 2004; Schneider & al. 2004c), Hymenophyllaceae Link (Pryer & al. 2001b; Hennequin & al. 2006), Polypodiaceae J. Presl (Haufler & al. 2003; Schneider & al. 2004d), Pteridaceae E.D.M. Kirchn. (Sánchez-Baracaldo, 2004; Schuettpelz & al. 2007), and Thelypteridaceae (Smith & Cranfill 2002).

This study focuses on Thelypteridaceae, which is one of the largest fern families with about 1,000 species distributed mostly in tropical and subtropical regions (Smith 1974, 1988, 1990; Tryon & Tryon 1982). Members of the Thelypteridaceae (Figure 2) are characterized by having two hippocampus-shaped vascular bundles at the base of the petioles that fuse into a single U-shaped strand distally; and by unicellular, acicular or branched hairs on the adaxial side of the rachises, costae and laminar tissue (Smith 1974, 1990; Holttum 1977). Recent phylogenetic studies based on the chloroplast gene *rbcL* (Hasebe & al. 1995; Pryer & al. 1995), combined chloroplast data from genes *rps4*, and the spacers *rps4-trnS*, and *trnL-trnF* (Smith & Cranfill 2002), and *rbcL*, *atpB*, and *atpA*

(Schuettpelz & Pryer 2007), show the Thelypteridaceae to be monophyletic and sister to a clade comprising members from Aspleniaceae, Woodsiaceae (Hook.) Herter, Onocleaceae Pic. Serm., and Blechnaceae (C. Presl) Copel. (Smith & Cranfill 2002; Schuettpelz & Pryer 2007).

There are basically two disparate points of view on generic circumscription within Thelypteridaceae. On one extreme, Morton (1963) recognized only one genus, *Thelypteris*, in the entire family. On the other extreme, 18 to 32 genera in the Thelypteridaceae have been recognized by others (Ching 1963; Holttum 1971; Pichi Sermolli 1977). Smith (1990) proposed an intermediate view recognizing five genera (*Thelypteris*, *Cyclosorus* Link, *Macrothelypteris* (H. Itô) Ching, *Phegopteris* (C. Presl) Fée, and *Pseudophegopteris* Ching). The studies of Smith & Cranfill (2002) provided strong support for the recognition of a phegopteroid lineage, comprising *Macrothelypteris*, *Phegopteris*, and *Pseudophegopteris*, and a cyclosoroid group, comprising *Cyclosorus* (sensu Smith 1990); *Thelypteris* (sensu Smith 1990) was resolved as paraphyletic in relation to the cyclosoroids. Nevertheless, Smith & Cranfill (2002) were non-committal about what genera should be recognized in the family. This study follows the taxonomy of Smith (1990).

The focus of this work is *Thelypteris* subg. *Amauropelta*, a large subgenus with at least 200 species, most of them neotropical (Smith 1974, 1983a). Species of subg. *Amauropelta* are characterized by having creeping to erect rhizomes; proximal pinnae that are usually reduced; simple veins with the lowermost of them usually meeting the margins of segments distally to the sinuses; indusiate or exindusiate sori; spores with a densely reticulate perispore; and a base chromosome number (x) of 29 (Smith 1990). This group has been largely recognized taxonomically at subgeneric and generic levels based on the aforementioned traits; the neotropical species have been treated in nine sections by Smith (1974): *Adenophyllum* A.R. Sm., *Amauropelta*, *Apelta* A.R. Sm., *Blennocaulon* A.R. Sm., *Blepharitheca* A.R. Sm., *Lepidoneuron* A.R. Sm., *Pachyrachis* A.R. Sm., *Phacelothrix* A.R. Sm., and *Uncinella* A.R. Sm.

The major center of diversity for most sections is the Andean region of Colombia, Ecuador, and Peru (Smith 1983a). However, sect. *Amauropelta* has a secondary center of diversity in the Caribbean Islands (Smith 1974); twenty-two of the 25 species that occur there are endemic (this dissertation, Chapter 4).

At a higher taxonomic level, 35 of the 50 (70%) species of subg. *Amauropelta* in the Caribbean Islands are endemic to the area (this dissertation, Chapter 4). This parallels high levels of endemism reported for flowering plant taxa in the Caribbean region (Santiago-Valentin & Olmstead 2004; Francisco-Ortega & al. 2007).

The aims for this study were to: 1) test the monophyly of *Thelypteris* subg. *Amauropelta* using sequence data of the chloroplast gene *rps4*, and spacers *rps4-trnS*, and *trnL-trnF*; 2) gain insights into the evolutionary relationships of some of the major sections within *Thelypteris* subg. *Amauropelta*; and 3) improve the taxonomy of Thelypteridaceae based on the resulting phylogeny.

MATERIALS AND METHODS

Sampling. In order to test the phylogenetic position of subg. *Amauropelta* within *Thelypteris,* I sampled 24 taxa, two from sect. *Adenophyllum*, eleven from sect.

Amauropelta, two from sect. *Lepidoneuron*, and nine from sect. *Uncinella*; 88% of the 200 species present in subg. *Amauropelta* are represented in these four sections. When possible, representatives from a species across a variety of habitats and from throughout the geographic ranges were included. Thirty-two more thelypteroid taxa, including the type of *Thelypteris*, *T. palustris* Schott, were taken from GenBank from the study of Smith & Cranfill (2002); *T. limbosperma* (All.) H.P. Fuchs was excluded from the analysis because of the lack of sequence data for the *trnL-F* spacer region (Table 1). Based on Smith & Cranfill (2002), three species from the Woodsiaceae were selected as outgroups: *Acystopteris japonica* (Luerss.) Nakai, *Cystopteris protrusa* (Weath.) Blasdell, and *Gymnocarpium oyamense* (Baker) Ching; all remaining taxa comprised the ingroup.

Fresh material was available for 13 taxa, all of which were collected by the author in Cuba, Hispaniola, Jamaica, and Ecuador. When fresh material was unavailable, tissue was extracted, with permission, directly from herbarium specimens. Voucher specimens or GenBank accession numbers are listed in Table 1.

DNA isolation, amplification, and sequencing. Total genomic DNA was extracted from silica-dried, or herbarium leaf material. DNA extraction methods follow the Doyle & Doyle (1987) cetyltrimethyl-ammonium-bromide (CTAB) protocol with modifications from Loockerman & Jansen (1996). Amplification of plastid DNA fragments (the coding region *rps4* and two non-coding spacers, *rps4-trn*S and *trn*L-*trn*F) follow Smith & Cranfill (2002). These markers have been shown to be phylogenetically useful, are well-characterized (Taberlet & al. 1991; Nadot & al. 1994, 1995), and are known to be variable within Thelypteridaceae (Smith & Cranfill 2002). Forward primer *e*

(3'–GGTTCAAGTCCCTCTATCCC–5') and reverse primer *f* (5'–ATTTGAACTGGTGACACGAG–3'), for *trn*L-*trn*F non-coding region, follow Taberlet & al. (1991); forward primer *rps*5' (5'–ATGTCCCGTTATCGAGGACCT-3') and reverse primer *trn*S R (5'–TACCGAGGGTTCGAATC–3'), were used to amplify the *rps4* amplicon, which include the coding region *rps4* plus the intergenic spacer *rps4-trn*S (Nadot & al. 1995; Smith & Cranfill 2002; Sánchez-Baracaldo 2004; Shaw & al. 2005).

The polymerase chain reaction (PCR) amplifications took place in a 25 µL reaction mixture containing: 0.25 µL of AmpliTaq Gold polymerase (Applied Biosystems), 2.5 µL of the supplied reaction buffer II, 2 µL (25 mM) of the supplied magnesium chloride solution ($MgCl_2$), 1.25 µL of Dimethyl sulfoxide (DMSO), 2 µL (0.2 mM) of all four dNTPs, 0.5 µL (0.2 mM) of each primer, 1 µL of total DNA, and purified water (ddH_2O) to volume. Optimized PCR cycle lengths and temperatures were as follows: an initial hot start of 96°C for 5 min, 35 cycles (96°C for 60 s, 51°C for 120 s, and 72°C for 150 s) and a final extension step at 72°C for 5 min. All reactions were performed on a MJ Research PTC-100 thermacycler.

Several unsuccessful attempts were made to amplify the internal transcribed spacer (ITS) regions (ITS1, the 5.8 gene, and ITS2) of nuclear ribosomal DNA. I used the reverse primer ITS4, and forward primers ITS1 and ITS5, from White & al. (1990), as well as the novel forward primer (5'–CCTGCGGAAGGATACTTGTCG–3') developed by Van den Heede & al. (2003).

PCR products were purified after positive band visualization on agarose gels with the QIAquick PCR purification kit (Qiagen) according to the supplied protocol. Sequencing reactions were performed using Applied Biosystems cycle sequencing technology, on an ABI PRISM® 3730 Genetic Analyzer at the Genomic Core of the center of Research Technology Support Facility (RTSF) at Michigan State University.

Sequence alignment and phylogenetic analyses. Sequence assembly and alignments were performed using MacGDE 2.3 (http//www.msu.edu/~lintone/macgde). Sequences were manually edited and gaps were inserted or deleted where necessary (Appendix A). Gaps were scored as missing data. Termini of the chloroplast regions were determined by comparison with published sequences of Smith & Cranfill (2002) used in this study.

Maximum parsimony analyses (MP) were conducted using PAUP* (Version 4.0b4; Swofford 2000). Heuristic searches were complete using a 100 random addition sequences replicates, tree bisection-reconnection (TBR) branch swapping, MULTrees option on, and collapse zero-length branches were turned off. All other settings follow the standard defaults. Bootstrap analyses (Felsenstein 1985) were conducted using 1000 replicates with 10 random addition sequences per replicate, but saving only 100 trees for each search. Branches with a bootstrap percentage (BP) $\geq$ 90% were considered as well supported, 70% < BP > 89% as moderately supported, and BP < 70% as weakly or not supported. Consistency index (CI) and retention index (RI) were calculated based on 461 parsimony informative characters.

RESULTS

The aligned sequences of the combined dataset (*rps*4 + *rps*4-*trnS* spacer + *trnL-trnF* spacer) were 1380 bp long, with a total of 461 phylogenetically informative characters. Phylogenetic analyses resulted in 181 most parsimonious trees (Figure 3) with a length of 1335 steps; CI = 0.498, and RI = 0.750.

The strict consensus tree (Figure 4) shows the two major lineages within Thelypteridaceae (Smith & Cranfill 2002) recovered with high bootstrap support: the Phegopteroid (A) lineage (BP = 88%), including *Macrothelypteris*, *Phegopteris*, and *Pseudophegopteris*; and the Thelypteroid (B) lineage (BP = 95%), which includes the remaining clades. Within B *Thelypteris s.s.*, represented by *T. palustris*, corresponds to Smith's (1990) *Thelypteris* subg. *Thelypteris* and was resolved basal and sister to a moderately-supported clade C (BP = 74%) comprising *Cyclosorus s.l.* and *Thelypteris* subgenera *Amauropelta*, *Coryphopteris*, *Metathelypteris*, and *Parathelypteris* (all sensu Smith 1990). Lineage C includes two subclades: 1) D (BP = 97%), including *Cyclosorus s.l.*; and 2) E (BP = 77%), including the remaining C.

Nine species of the D subclade and two species from E have no current name and need a new combination in their respective genera; therefore, they are listed here under their segregate generic names following Holttum (1971).

As in previous studies (Smith & Cranfill 2002; Schuettpelz & Pryer 2007) *Thelypteris* (sensu Smith 1990) was not resolved as monophyletic; instead it is paraphyletic to the cyclosoroids (BP = 74%).

Within the E lineage, there is strong support (BP = 99%) for a subclade F containing *T. nevadensis* (subg. *Parathelypteris*), sister to a strongly supported (BP = 100%) group (AMAU) that comprises all the species of subg. *Amauropelta* sampled in this study (Figure 4). The second subclade G was formed by *Metathelypteris dayi* and *Coryphopteris seemanii* and is weakly supported (BP < 50%).

There was a weakly supported split between two major lineages in AMAU (Figures 4, 5): I (BP = 50%) including species of sections *Adenophyllum*, *Amauropelta*, *Lepidoneuron*, and *Uncinella*; and II (BP = 54%) with the remaining species of sect. *Amauropelta* included in this analysis. The topology of I is not well resolved in the strict consensus tree (Figure 4), and only a few nodes received high bootstrap support.

DISCUSSION

Monophyly of subg. Amauropelta (sensu Smith 1990) and taxonomic implications. Recognition of non-monophyletic genera in Thelypteridaceae taxonomy is one of the biggest problems to be resolved in order to reach a consensus towards a cohesive and comprehensive generic classification system for the family (Holttum 1969, 1970; Smith 1971a, 1983b). This problem is apparent in modern floristic studies from the Old World and New World. Old World studies (Roux 2001 [South Africa]; Chaerle & Viane 2002 [Ethiopia]; Beaman & Edwards 2007 [Sabah]) follow Holttum (1971); while New World studies (Smith 1992 [Peru], 1993a [North America], 1993b [Guianas]; Pérez-García & al. 1999 [Mexico]; Mickel & Smith 2004 [Mexico]; Sánchez & al. 2006 [Cuba]) usually follow Morton (1963) with few modifications, e.g., recognition of

Macrothelypteris and *Phegopteris* at the generic rank. Previous studies in cytology (Smith 1971a; Walker 1973; Löve & al. 1977), palynology (Wood 1973; Tryon & Tryon 1982; Tryon & Lugardon 1991), morphology (Christensen 1907, 1913; Holttum 1969, 1970, 1971; Smith 1971b, 1974, 1990; Proctor 1985a), and phylogenetics (Smith & Cranfill 2002; Schuettpelz & Pryer 2007) have provided support for the monophyly of some groups like *Macrothelypteris*, *Phegopteris*, *Cyclosorus*, or subg. *Amauropelta*, and several other studies have addressed the need of a more cohesive classification system of Thelypteridaceae (Lellinger 1985; Smith & Cranfill 2002; Schuettpelz & Pryer 2007) suggesting that an improved taxonomic classification is needed.

In order to recognize monophyletic groups, *Thelypteris* (sensu Smith 1990) could be split into multiple genera, or other currently recognized genera, such as *Cyclosorus*, could be subsumed into an even more inclusive *Thelypteris*. This study, however, supports both: 1) dismantling of *Thelypteris* (sensu Smith 1990) into six or fewer genera (e.g., *Thelypteris*, *Amauropelta*, *Parathelypteris*, *Metathelypteris*, *Coryphopteris*, and, potentially, *Oreopteris*) and recognition of *Cyclosorus s.l.* (sensu Smith 1990); or 2) inclusion of *Cyclosorus* into *Thelypteris* (all sensu Smith 1990).

I support dismantling of *Thelypteris* and recognition of *Cyclosorus s.l.* (sensu Smith 1990). *Thelypteris*, as defined by Morton (1963), Smith (1990), and, more recently, Smith & al. (2006), is paraphyletic in reference to the cyclosoroid group (Figure 4). This phylogeny also shows monophyletic groups, i.e. potential genera, with various degrees of bootstrap support; for instance the separation of *T. palustris* from clade C (BP = 74%); the monophyly of *Cyclosorus s.l.* (BP = 97%), and the monophyly of *Thelypteris* subg. *Amauropelta* (BP = 100%), which here is resolved as sister to subg. *Parathelypteris* (*T.*

nevadensis), a free-veined group represented in temperate North America. *Thelypteris nevadensis* is a temperate species that differs from those in subg. *Amauropelta* by having spores with a spiny reticulum and base chromosome number (*x*) of 27, while species in subg. *Amauropelta* are mainly tropical ones and have spores with a lattice-like reticulum and base chromosome number (*x*) of 29. The two other free-veined groups in the lineage E are subgenera *Coryphopteris* and *Metathelypteris*, which comprise only Old World taxa and were resolved as sisters to the subclade F (Figures 4, 5).

The phylogenetic relationships observed here can be correlated, mainly, with three characters: venation patterns, spore morphology, and base chromosome number. Species of *Cyclosorus s.l.* are characterized by veins that are connivent at the sinus or variously anastomosed below the sinus (Tryon & Tryon 1982; Smith 1990; Smith & Cranfill 2002); spore architecture exhibits prominent coarse ridges that form a winged structure (Walker 1973; Wood 1973; Tryon & Tryon 1982; Tryon & Lugardon 1991); and base chromosome number (*x*) of 36 (Smith 1971a; Löve & al. 1977; Smith & Cranfill 2002). *Thelypteris* (sensu Smith 1990) have species with free veins; spores with various architecture that range from echinate to finely reticulate, lattice-like, surfaces; and base chromosome number from 27 to 35 (Walker 1973; Wood 1973; Tryon & Tryon 1982; Smith 1990; Tryon & Lugardon 1991). Correlations between spore architecture and base chromosome number in Thelypteridaceae was first reported by Walker (1973) and Wood (1973), and later by Tryon & Tryon (1982); these authors clearly delimited the species of subg. *Amauropelta*, from other subgenera within *Thelypteris*, based on a consistent pattern of raised and uniformly reticulate spore perispore (type IIa.i after Wood 1973) and base chromosome number x=29. Wood (1973) even suggested resurrection of the genus *Amauropelta* based on these characteristics together with macromorphology. The remaining subgenera of *Thelypteris* (sensu Smith 1990) differ from subg. *Amauropelta* and among themselves in both spore architecture and base chromosome number. For example, subgenera *Parathelypteris* and *Thelypteris* have spores with spiny reticulae (type IIc.ii after Wood 1973); subg. *Thelypteris* has base chromosome numbers of x=35 while base chromosome numbers are more variable in subg. *Parathelypteris*: x=27, 31, 32, and 34 (Smith 1971a; Walker 1973; Löve & al. 1977; Smith & Cranfill 2002). These morphological details are more fully discussed in Smith & Cranfill (2002).

Insights on the sectional classification of subg. Amauropelta. Section *Amauropelta*, as defined by Smith (1974), is paraphyletic (Figure 5). In this analysis, all the species (except *T. globulifera*) with abaxial laminar tissue densely furnished with sessile, reddish, globular glands are found in the clade II, sister to the remaining species of the subgenus.

Sister to clade II is clade I (Figure 5), which includes several species from sect. *Uncinella*, two species from sect. *Lepidoneuron* (*T. rudis* and *T. corazonensis*), two species from sect. *Adenophyllum* (*T. glandulosolanosa* and *T. pilosula*), and five species from sect. *Amauropelta* (*T. globulifera*, *T. rufa*, *T. sancta*, *T. basisceletica*, and *T. firma*). The lack of resolution of clade I prevents strong conclusions about the relationships among these sections. This lack of resolution could result from limited sampling or from little phylogenetic signal in this portion of the tree, or both.

Within lineage I only three moderately-supported clades merit further discussion. Two of these lineages are formed by species from sect. *Uncinella*: 1) the lineage ending in *T. linkiana* and *T. rosenstockii* (BP = 87%), which agrees with Smith's (1974) group characterized by exindusiate and elongate sori, and shallow pinnae; and 2) the lineage formed by *T. inabonensis* and *T. germaniana* (BP = 76%), which correspond with Smith's (1974) group of species having more or less prominent aerophores, indusiate sori with greenish indusia, and scaly axes.

The third lineage is a well-supported polytomy (BP = 93%) formed by *T. sancta*, *T. basisceletica*, and *T. firma*; all from sect. *Amauropelta* (sensu Smith 1974). The latter three species are characterized by having acicular hairs in laminar tissue and axes vs. the uncinate or hamate hairs that define sect. *Uncinella*. Other diagnostic characters shared by these taxa, like the presence of veins prominently raised adaxially, subcoriaceous texture, loss of glands or reduced glandular density in abaxial laminar tissues, and, usually, bipinnate laminae with free pinnules at the base of medial pinnae, are unique character combinations within subg. *Amauropelta*; these were first noted by Smith (1974) who suggested subsectional recognition for the group of *T. firma* and allies. The present study also suggest the segregation of this particular group from sect. *Amauropelta.*

Previous comparative morphological studies of the sections of subg. *Amauropelta* (Smith 1974) recognized a close relationship between members of sections *Uncinella*, *Lepidoneuron*, and *Adenophyllum* but no close relationship with any species from sect. *Amauropelta* (as suggested in Figures 4 and 5); however, no definite conclusions can be drawn in reference to the sectional classification of Smith (1974) because my sampling size covers only approximately 10% of all species in subg. *Amauropelta* and resolution is very limited in this part of the phylogeny. Representative species from sections *Apelta*, *Blennocaulon*, *Blepharitheca*, *Pachyrachis,* and *Phacelothrix* are absent in this analysis.

Conclusions. Conflicting topologies and poor resolution in the Amauropeltoid (E) clade (sensu Smith & Cranfill 2002) indicate the need to explore additional molecular markers in the study of phylogenetic relationships within Thelypteridaceae. Nevertheless, *Thelypteris* (sensu Smith 1990) is paraphyletic in reference to the cyclosoroids as shown in previous studies (Smith & Cranfill 2002; Schuettpelz & Pryer 2007). The paraphyletic nature of *Thelypteris s.l.* stresses the need for a new, and cohesive, classification system for Thelypteridaceae. Our best approach towards a stable classification of the family would require recognition of *Thelypteris* in a strict sense and would recognize *Amauropelta* at the generic rank. By doing so, there would be some other groups within *Thelypteris* (sensu Smith 1990) that will merit generic recognition as well; these names have been previously used at the generic rank (e.g., Holttum 1971): *Coryphopteris*, *Metathelypteris*, *Oreopteris*, and *Parathelypteris*. Further sampling, however, is needed to reach a consensus in this matter. Despite encouraging preliminary results, the chloroplast DNA regions selected for this study do not provided adequate resolution to infer relationships among sections and/or species of *Thelypteris* subg. *Amauropelta.* More molecular markers and a broader sampling will be necessary to reach a consensus for sectional relationships within subg. *Amauropelta.*

Table 1. Voucher information for all taxa used in this study. Ingroup taxa are arranged alphabetically following Smith (1990). Nine species of the Cyclosoroid subclade and two species from the Amauropeltoids have no current name and need a new combination in the genus; therefore, they are listed here under their segregate generic names following Holttum (1971). The three outgroup species are listed last. Vouchers information includes collector, collection number (or in its absent collecting dates), herbarium, and locality, or, for those taxa sequenced by Smith & Cranfill, publication information (Smith & Cranfill 2002) together with GenBank accession numbers (*rps4* + *rps4-trnS*, and *trnL-F*, listed respectively). New sequences generated in this study do not have GenBank accession numbers. NA = not available.

Christella augescens Link, Smith & Cranfill 2002, AF425166, AF425128; *Coryphopteris seemannii* Holttum, Smith & Cranfill 2002, AF425196, AF425129; *Cyclosorus aridus* (D. Don) Tagawa, Smith & Cranfill 2002, AF425164, NA; *Cyclosorus crassifolius* (Blume) S. Linds., Smith & Cranfill 2002, AF425174, AF425136; *Cyclosorus esquirolii* (H.Christ) Kuo, Smith & Cranfill 2002, AF425184, AF425142; *Cyclosorus griffithii* (T. Moore) Kuo, Smith & Cranfill 2002, AF425168, AF425131; *Cyclosorus hispidulus* (Decne.) Ching, Smith & Cranfill 2002, AF425165, AF425127; *Cyclosorus interruptus* (Willd.) H. Itô, Smith & Cranfill 2002, AF425167, AF425130; *Cyclosorus simplex* (Hook.) Copel. , Smith & Cranfill 2002, AF425183, AF425141; *Cyclosorus* sp. , Smith & Cranfill 2002, AF425173, AF425135; *Cyclosorus taiwanensis* (C.Chr.) H. Itô, Smith & Cranfill 2002, AF425187, NA; *Cyclosorus tottoides* (H. Itô) Kuo, Smith & Cranfill 2002, AF425171, AF425134; *Glaphyropteridopsis erubescens* Hook., Smith & Cranfill 2002, AF425169, AF425132; *Goniopteris poiteana* Bory, Smith & Cranfill 2002, AF425170, AF425133; *Macrothelypteris torresiana* (Gaud.) Ching, Smith & Cranfill 2002, AF425172, NA; *Metathelypteris dayi* Bedd., Smith & Cranfill 2002, AF425175, AF425137; *Nannothelypteris aoristisora* Harr., Smith & Cranfill 2002, AF425176, NA; *Phegopteris connectilis* (Michx.) Watt, Smith & Cranfill 2002, AF425179, AF425139; *Phegopteris decursivepinnata* (H.C. Hall) Fée, Smith & Cranfill 2002, AF425180, NA; *Plesioneuron archboldiae* Copel., Smith & Cranfill 2002, AF425181, NA; *Pneumatopteris ecallosa* Holttum, Smith & Cranfill 2002, AF425182, AF425140; *Pseudophegopteris aurita* (Hook.) Ching, Smith & Cranfill 2002, AF425185, NA; *Sphaerostephanos penniger* Hook., Smith & Cranfill 2002, AF425186, AF425143; *Steiropteris leprieurii* Hook., Smith & Cranfill 2002, AF425188, NA; *Thelypteris amphioxypteris* (Sodiro) A.R. Sm., *Alvarez-Fuentes et al. 608* (MSC), Ecuador; *Thelypteris balbisii* (Spreng.) Ching var. *balbisii*, *Alvarez-Fuentes et al. 527* (MSC), Jamaica; *Thelypteris balbisii* var. *longipilosa* (C.Chr.) C. Sánchez, O. Alvarez & Caluff, *Hill 25604* (US), Dominica; *Thelypteris basisceletica* C. Sánchez, Caluff & O. Alvarez, *Sánchez et al. 82028* (MSC), Cuba; *Thelypteris consanguinea* (Fée) Proctor, *Hill 25724* (US), Dominica; *Thelypteris corazonensis* (Baker) A.R. Sm., *Alvarez-Fuentes et al. 600* (MSC), Ecuador; *Thelypteris firma* (Baker ex Jenman) Proctor, *Alvarez-Fuentes et al. 556* (MSC), Jamaica; *Thelypteris germaniana* (Fée) Proctor, (CU1) *Sánchez et al. 82080* (MSC), Cuba; (CU2) *Sánchez et al. s.n.*, 22 Jan 2003 (MSC), Cuba; *Thelypteris glandulosolanosa* (C.Chr.) R.M. Tryon, *Alvarez-Fuentes et al. 589* (MSC), Ecuador; *Thelypteris globulifera* (Brack.) C.F. Reed, *Game s.n.*, 13 Feb 2005 (UC), Hawaii; *Thelypteris gracilis* (Heward) Proctor, *Alvarez-Fuentes et al. 548* (MSC), Jamaica; *Thelypteris heteroclita* (Desvaux) Ching, *Alvarez-Fuentes et al. 550* (MSC), Jamaica;

Table 1 (cont'd)

Thelypteris inabonensis Proctor, *Axelrod & Chavez 4312* (US), Puerto Rico; *Thelypteris linkiana* (C. Presl) R.M. Tryon, *Mickel 9088* (NY), Dominican Republic; *Thelypteris oligocarpa* (Humb. & Bonpl. ex Willd.) Ching, (CR) Smith & Cranfill 2002, AF425162, AF425125; (JA) *Alvarez-Fuentes et al. 532* (MSC), Jamaica; *Thelypteris opposita* (Vahl) Ching, *Knobloch s.n.*, 17 Jul 1985 (MSC), Trinidad; *Thelypteris pilosula* (Mett.) R.M.Tryon, *Alvarez-Fuentes et al. 570* (MSC), Ecuador; *Thelypteris resinifera* (Desv.) Proctor, *Alvarez-Fuentes et al. 502* (MSC), Jamaica; *Thelypteris rosenstockii* (C.Chr.) R.M. Tryon, *Alvarez-Fuentes et al. 583* (MSC), Ecuador; *Thelypteris rudis* (Kunze) Proctor, *Sánchez et al. 82081* (MSC), Cuba; *Thelypteris rufa* (Poir.) A.R. Sm., *Alvarez-Fuentes et al. 584* (MSC), Ecuador; *Thelypteris rustica* (Fée) Proctor, *Hill 24639* (US), Dominica; *Thelypteris sancta* (L.) Ching, *Alvarez-Fuentes et al. 512* (MSC), Jamaica; *Thelypteris limbosperma* (All.) H.P. Fuchs, Smith & Cranfill 2002, AF425177, NA; *Thelypteris nevadensis* (Baker) Clute ex C.V. Morton, Smith & Cranfill 2002, AF425178, AF425138; *Thelypteris palustris* Schott, Smith & Cranfill 2002, AF425189, AF425144; *Trigonospora ciliata* Benth., Smith & Cranfill 2002, AF425190, AF425145; *Acystopteris japonica* (Luerss.) Nakai, Smith & Cranfill 2002, AF425150, AF425121; *Cystopteris protrusa* (Weath.) Blasdell, Smith & Cranfill 2002, AF425148, AF425120; *Gymnocarpium oyamense* (Baker) Ching, Smith & Cranfill 2002, AF425149, NA.

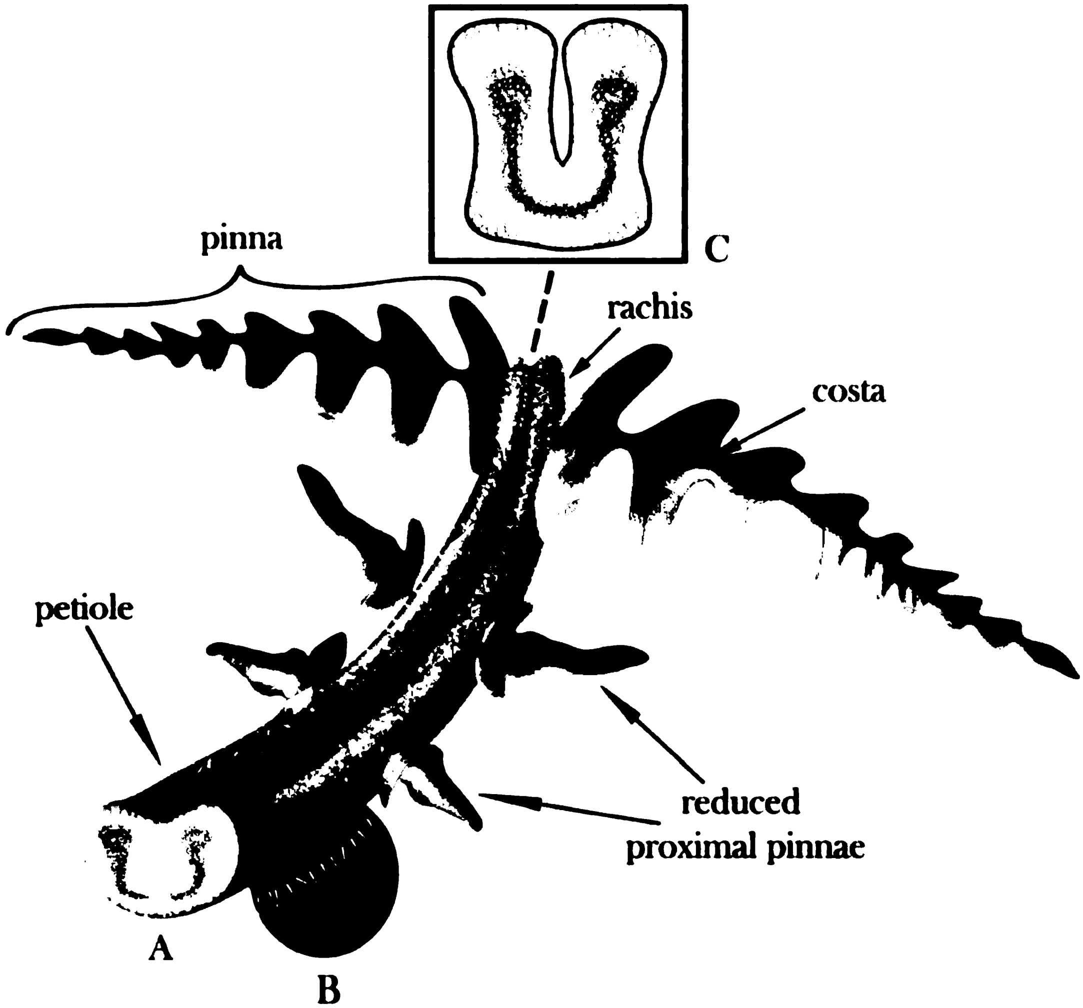
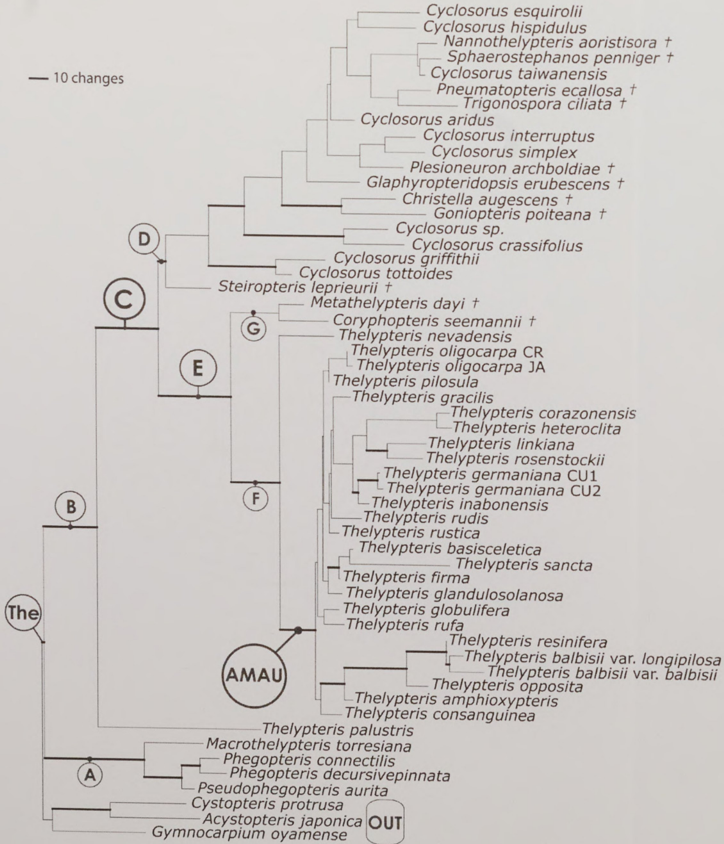


Figure 2. Thelypteridaceae: Schematic representation of a leaf section showing petiole, pinnae, and rachis. A. T-section of petiole showing two hypocampiform vascular strands. B. Detail showing unicellular acicular hairs. C. T-section of rachis showing a U-shaped single strand.

Figure 3. Thelypteridaceae phylogeny. One of 181 most parsimonious trees, based on analysis of plastid *rps4*, *rps4-trnS*, and *trnL-trnF* data including all 55 taxa from this study. Tree length = 1335, CI = 0.498, and RI = 0.750. The tree is presented as a phylogram to show branch lengths as proportional to the amount of change occurring along the branch. Bold branches represent bootstrap percentages ≥ 70%. Major clades discussed in text are indicated in circles on trees. "The" = Thelypteridaceae; "AMAU" = *Thelypteris* subg. *Amauropelta* (sensu Smith 1990); CR = Costa Rica; CU = Cuba; JA = Jamaica; OUT = outgroup. Nomenclature follows Smith (1990) except for eleven species (†) from subclades D and E that have no current name and need a new combination; therefore, they are listed here under their segregate generic names following Holttum (1971).



10 changes
Cyclosorus esquirolii
Cyclosorus hispidulus
Nannothelypteris aoristisora †
Sphaerostephanos penniger †
Cyclosorus taiwanensis
Pneumatopteris ecallosa †
Trigonospora ciliata †
Cyclosorus aridus
Cyclosorus interruptus
Cyclosorus simplex
Plesioneuron archboldiae †
Glaphyropteridopsis erubescens †
Christella augescens †
Goniopteris poiteana †
Cyclosorus sp.
Cyclosorus crassifolius
Cyclosorus griffithii
Cyclosorus tottoides
Steiropteris leprieurii †
Metathelypteris dayi †
Coryphopteris seemannii †
Thelypteris nevadensis
Thelypteris oligocarpa CR
Thelypteris oligocarpa JA
Thelypteris pilosula
Thelypteris gracilis
Thelypteris corazonensis
Thelypteris heteroclita
Thelypteris linkiana
Thelypteris rosenstockii
Thelypteris germaniana CU1
Thelypteris germaniana CU2
Thelypteris inabonensis
Thelypteris rudis
Thelypteris rustica
Thelypteris basisceletica
Thelypteris sancta
Thelypteris firma
Thelypteris glandulosolanosa
Thelypteris globulifera
Thelypteris rufa
Thelypteris resinifera
Thelypteris balbisii var. longipilosa
Thelypteris balbisii var. balbisii
Thelypteris opposita
Thelypteris amphioxypteris
Thelypteris consanguinea
Thelypteris palustris
Macrothelypteris torresiana
Phegopteris connectilis
Phegopteris decursivepinnata
Pseudophegopteris aurita
Cystopteris protrusa
Acystopteris japonica
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(*) f

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Figure 4. Strict consensus of 181 most parsimonious trees based on analysis of plastid *rps4*, *rps4-trnS*, and *trnL-trnF* data set including all 55 taxa from this study. Tree length = 1335, CI = 0.498, and RI = 0.750. Maximum parsimony bootstrap percentages are presented (only percentages ≥ 50 are given). Major clades discussed in text are indicated in circles on trees. "The" = Thelypteridaceae; "AMAU" = *Thelypteris* subg. *Amauropelta* (sensu Smith 1990); CR = Costa Rica; CU = Cuba; JA = Jamaica. Nomenclature follows Smith (1990) except for eleven species (*) from subclades D and E that have no current name and need a new combination; therefore, they are listed here under their segregate generic names following Holttum (1971).

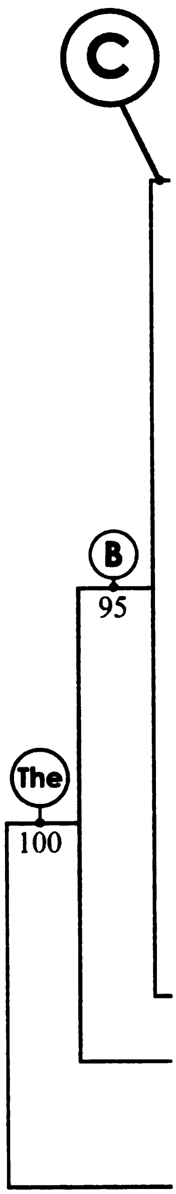
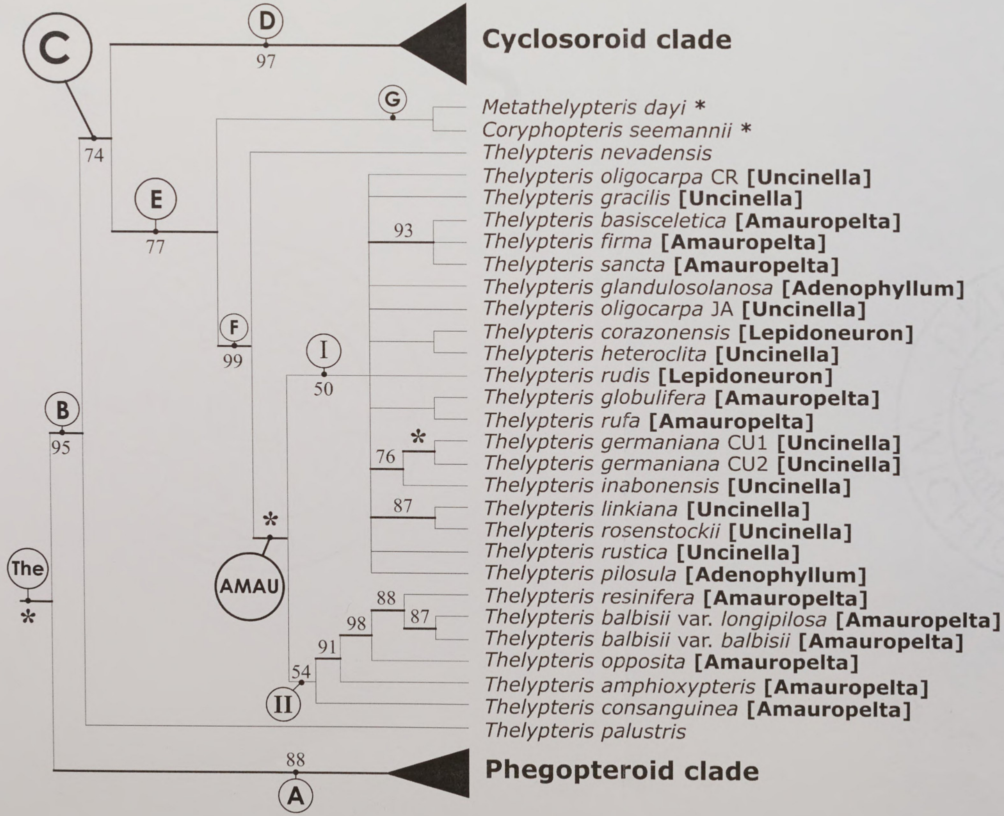

C
B
95
The
100

Figure 5. The Amauropeltoids. Graphic representation based on the strict consensus tree depicted in Figure 4 for comparative illustration within clade E. Maximum parsimony bootstrap percentages are presented (only percentages ≥ 50 are given, if ≥ 70 branches are bolded, * = 100%). Note that the three outgroup species have been pruned, and the branches of clades A and C have been collapsed to clarify discussion. Major clades discussed in text are indicated in circles on trees. "The" = Thelypteridaceae; "AMAU" = *Thelypteris* subg. *Amauropelta* (sensu Smith 1990); CR = Costa Rica; CU = Cuba; JA = Jamaica. Nomenclature follows Smith (1990) except for *Metathelypteris dayi* and *Coryphopteris seemannii* listed here under their segregate generic names following Holttum (1971); names in brackets represent sectional classification (sensu Smith 1974).


C
D
97
Cyclosoroid clade
G
Metathelypteris dayi *
Coryphopteris seemannii *
74
Thelypteris nevadensis
Thelypteris oligocarpa CR [Uncinella]
E
Thelypteris gracilis [Uncinella]
Thelypteris basisceletica [Amauropelta]
93
77
Thelypteris firma [Amauropelta]
Thelypteris sancta [Amauropelta]
Thelypteris glandulosolanosa [Adenophyllum]
Thelypteris oligocarpa JA [Uncinella]
F
Thelypteris corazonensis [Lepidoneuron]
99
I
Thelypteris heteroclita [Uncinella]
Thelypteris rudis [Lepidoneuron]
50
B
Thelypteris globulifera [Amauropelta]
Thelypteris rufa [Amauropelta]
*
95
Thelypteris germaniana CU1 [Uncinella]
76
Thelypteris germaniana CU2 [Uncinella]
Thelypteris inabonensis [Uncinella]
87
Thelypteris linkiana [Uncinella]
*
Thelypteris rosenstockii [Uncinella]
Thelypteris rustica [Uncinella]
The
AMAU
Thelypteris pilosula [Adenophyllum]
88
Thelypteris resinifera [Amauropelta]
*
87
Thelypteris balbisii var. longipilosa [Amauropelta]
98
Thelypteris balbisii var. balbisii [Amauropelta]
91
Thelypteris opposita [Amauropelta]
54
Thelypteris amphioxypteris [Amauropelta]
II
Thelypteris consanguinea [Amauropelta]
Thelypteris palustris
88
Phegopteroid clade
A

CHAPTER 3

NEW COMBINATIONS FOR SOME CARIBBEAN AND CONTINENTAL AMERICAN SPECIES OF *AMAUROPELTA* (THELYPTERIDACEAE)

Subgenus *Amauropelta* will be treated at generic level in the following chapters 4, 5, and 6. For that reason and, in order to provide clarity to the discussion, it is necessary to made several new combinations to *Amauropelta* for the Caribbean and some continental American species. The following new combinations are proposed; species names are arranged alphabetically.

Amauropelta aliena (C.Chr.) O. Alvarez, **comb. nov.** *Dryopteris aliena* C.Chr., Kongl. Svenska Vetensk. Acad. Handl., ser. 3, 16: 23, *t. 4, f. 1-3*. 1937.—Type. HAITI, **Nord**: Massif du Nord, Vallière, top of Morne Salvane, *Ekman H9935* (holotype: S; isotype: US!).

Amauropelta antillana (Proctor) O. Alvarez, **comb. nov.** *Thelypteris antillana* Proctor, Rhodora 63: 33. 1961.—Type. ST. KITTS: Upper SW spur of Verchild's Mountain below Dodans Pond, *Proctor 19587* (holotype: A!; isotype: IJ!).

Amauropelta balbisii (Spreng.) O. Alvarez **var. *balbisii* comb. nov.** *Polypodium balbisii* Spreng., Nova Acta Phys.-Med. Acad. Caes. Leop.-Carol. Nat. Cur. 10: 228. 1821. *Aspidium balbisii* (Spreng.) Kuhn, J. Bot. 15: 231. 1877. *Dryopteris balbisii* (Spreng.) Urb., Symb. Antill. (Urban). 4: 14. 1903. *Dryopteris sancta* var. *balbisii* (Spreng.) C.Chr., Kongel. Danske Vidensk. Selsk. Skr., Naturvidensk. Math. Afd., ser. 7, 4: 296, *f. 20*. 1907. *Thelypteris balbisii* (Spreng.) Ching, Bull. Fan Mem. Inst. Biol. Bot. 10: 250. 1941.—Type: PUERTO RICO: *Bertero* (as *Bertier*) *s.n.* (holotype: **lost** [*fide* Morton

1963]); Neotype: DOMINICA: Along Castle Bruce track, vicinity of N bases of Trois Pitons, *Hodge & Hodge 1203* (neotype chosen by Proctor, 1977: 281: GH!).

Amauropelta balbisii* var. *longipilosa (C.Chr.) O. Alvarez, **comb. nov.** *Dryopteris sprengelii* var. *longipilosa* C.Chr., Kongl. Svenska Vetensk. Acad. Handl., ser. 3, 16: 23. 1937. *Thelypteris balbisii* var. *longipilosa* (C.Chr.) C. Sánchez, O. Alvarez & Caluff, Amer. Fern J. 95: 40, *f. 6 C, D*. 2005.—Type. HAITI, **Sud**: Massif de la Hotte, western group, Torbec, Les Platons, at the source, *Ekman H 7416* (holotype: S!; isotype: US!)

Amauropelta basiattenuata (Jenman) O. Alvarez, **comb. nov.** *Nephrodium basiattenuatum* Jenman, Gard. Chron., ser. 3, 15: 330. 1894 [or] Bull. Bot. Dept. Jamaica, n.s. 3: 20. 1896. *Aspidium basiattenuatum* (Jenman) Jenman, Gard. Chron., ser. 3, 17: 132. 1895. *Dryopteris basiattenuata* (Jenman) C.Chr., Index Filic. 254. 1905. *Thelypteris basiattenuata* (Jenman) Proctor, Brit. Fern Gaz. 10: 25. 1968.—Type. JAMAICA, **St. Andrew**: From Mount Moses, *J. P. 368* (holotype: IJ!, [photo deposited at US!]; isotype: US [fragment!]).

Amauropelta basisceletica (C. Sánchez, Caluff & O. Alvarez) O. Alvarez, **comb. nov.** *Thelypteris basisceletica* C. Sánchez, Caluff & O. Alvarez, Amer. Fern J.

95: 30, *f. 1*. 2005.—Type. CUBA, **Granma**: Buey Arriba, Pico La Bayamesa, *Alvarez et al. 64440* (holotype: HAJB!).

Amauropelta consanguinea (Fée) O. Alvarez, **comb. nov.** *Aspidium consanguineum* Fée, Mém. Foug., 11. Hist. Foug. Antil. 76, *t. 20, f. 3*. 1866. *Dryopteris consanguinea* (Fée) C.Chr., Kongel. Danske Vidensk. Selsk. Skr., Naturvidensk. Math. Afd., ser. 7, 4: 297. *f. 21*. 1907. *Thelypteris consanguinea* (Fée) Proctor, Rhodora 61: 306. 1959 [1960].—Type. GUADELOUPE: *L'Herminier 10* (holotype:?, not found at P; isotypes: B [digital photo! – Herb. Mett.], IJ!).

Amauropelta consimilis (Fée ex Baker) O. Alvarez, **comb. nov.** *Gymnogramma gracilis* var. *consimilis* Fée ex Baker, Syn. Fil. (Hooker & Baker) 377. 1868. *Gymnogramma consimilis* (Fée ex Baker) Jenman, Bull. Bot. Dept. Jamaica, n.s. 4: 203. 1897. *Dryopteris consimilis* (Fée ex Baker) C.Chr., Kongel. Danske Vidensk. Selsk. Skr., Naturvidensk. Math. Afd., ser. 7, 4: 314. *f. 37*. 1907. *Thelypteris consimilis* (Fée ex Baker) Proctor, Rhodora 68: 468. 1966.—Type. GUADELOUPE: *L'Herminier 73* (holotype: L [photo deposited at MICH!]).

Amauropelta cooleyi (Proctor) O. Alvarez, **comb. nov.** *Thelypteris cooleyi* Proctor, Rhodora 68: 468. 1966.—Type. ST. VINCENT, **St. David**: Upper outer slopes of the Soufriere, *Proctor 26008* (holotype: IJ!; isotypes: A!, GH!, U [digital photo!], US!).

Amauropelta decrescens (Proctor) O. Alvarez, **comb. nov.** *Thelypteris decrescens* Proctor, Amer. Fern J. 71: 57. 1981.—Type. JAMAICA, **St. Thomas**: From upper W slope of Blue Mountain Peak, *Underwood 1513* (holotype: NY!).

Amauropelta ekmanii (A.R. Smith ex Lellinger) O. Alvarez, **comb. nov.** *Thelypteris ekmanii* A.R. Sm. ex Lellinger, Amer. Fern J. 74: 60. 1984. *Dryopteris reducta* C.Chr., Kongl. Svenska Vetensk. Acad. Handl., ser. 3, 16: 18, *t. 2, f. 1-3.* 1937; *non Thelypteris reducta* Small, Index No. Amer. Ferns 77. 1938.–-TYPE: DOMINICAN REPUBLIC, **La Vega**: Valle Nuevo, *Ekman H13839* (holotype: S; isotype: US!).

Amauropelta firma (Baker ex Jenman) O. Alvarez, **comb. nov.** *Nephrodium firmum* Baker ex Jenman, J. Bot. 17: 260. 1879. *Dryopteris firma* (Baker ex Jenman) C.Chr., Index Filic. 266. 1905. *Thelypteris firma* (Baker ex Jenman) Proctor, Bull. Inst. Jamaica, Sci. Ser. 5: 60. 1953.—Type. JAMAICA, **Portland**: From Blue Mountain Peak, *Jenman 36* (holotype: K).

Amauropelta frigida (H.Christ) O. Alvarez, **comb. nov.** *Aspidium frigidum* H.Christ, Bull. Herb. Boissier sér. 2, 6: 160. 1906. *Thelypteris frigida* (H.Christ) A.R.

Smith & Lellinger, Amer. Fern J. 75: 31. 1985.—Type. COSTA RICA, **Cartago**: Volcan Turrialba, *Werckle s.n.* (holotype: P).

Amauropelta funckii (Mett.) O. Alvarez, **comb. nov.** *Aspidium funckii* Mett., Ann. Sci. Nat., Bot. sér. 5, 2: 246. 1864. *Dryopteris funckii* (Mett.) Kuntze, Revis. Gen. Pl. 2: 812. 1891. *Thelypteris funckii* (Mett.) Proctor, J. Wash. Acad. Sci. 48: 233. 1958.—Type. VENEZUELA: *Funck 502* (lectotype chosen by Christensen 1907: 299: B [digital photo!]).

Amauropelta germaniana (Fée) O. Alvarez, **comb. nov.** *Phegopteris germaniana* Fée, Mém. Foug., 11. Hist. Foug. Antil. 55, *t. 13, f. 2*. 1866. *Polypodium germanianum* (Fée) Baker, Syn. Fil. (Hooker & Baker) 306. 1867. *Dryopteris germaniana* (Fée) C.Chr., Index Filic. 267. 1905. *Lastrea germaniana* (Fée) Copel., Gen. Fil. (Ann. Cryptog. Phytopathol. 5) 139. 1947. *Thelypteris germaniana* (Fée) Proctor, Rhodora 61: 306. 1960.—Type. GUADELOUPE: 1861, *L'Herminier s.n.* (holotype: P [digital photo!]; isotypes: BM, P [digital photo!]).

Amauropelta glutinosa (C.Chr.) O. Alvarez, **comb. nov.** *Dryopteris glutinosa* C.Chr., Kongl. Svenska Vetensk. Acad. Handl., ser. 3, 16: 18, *t. 3, f. 1-4*. 1937. *Thelypteris glutinosa* (C.Chr.) C.V. Morton, Amer. Fern J. 53: 66. 1963.—Type. HAITI, **Sud**: Massif de la Hotte, western group, Torbec, top of Morne Formon, *Ekman H7500* (holotype: S; isotype: US!).

Amauropelta gracilenta (Jenman) O. Alvarez, **comb. nov.** *Polypodium gracilentum* Jenman, Bull. Bot. Dept. Jamaica, n.s. 4: 129. 1897. *Dryopteris gracilenta* (Jenman) C.Chr., Index Filic. 268. 1905. *Thelypteris gracilenta* (Jenman) Proctor, Amer. Fern J. 71: 60. 1981.—Type. JAMAICA: *Jenman s.n.* (holotype: NY!).

Amauropelta gracilis (Heward) O. Alvarez, **comb. nov.** *Gymnogramma gracilis* Heward, Mag. Nat. Hist., ser. 2, 2: 457. 1838. *Leptogramma gracilis* (Heward) J. Sm., J. Bot. (Hooker) 4: 52. 1841. *Grammitis hewardii* T. Moore, Gard. Chron. 261. 1856. (based on *Gymnogramma gracilis* Heward). *nom. illeg.* *Polypodium hewardii* (T. Moore) Griseb., Fl. Brit. W.I. [Grisebach]. 696. 1864. *Dryopteris gracilis* (Heward) Domin, Rozpr. Kral. Ceske Spolecn. Nauk, Tr. Mat.-Prir., N.s. 2: 210. 1929. *Thelypteris gracilis* (Heward) Proctor, Bull. Inst. Jamaica, Sci. Ser. 5: 60. 1953.—Type. JAMAICA. **Manchester**: From Old England, 1824, *Heward s.n.* (holotype: K).

Amauropelta hastiloba (C.Chr.) O. Alvarez, **comb. nov.** *Dryopteris hastiloba* C.Chr., Kongl. Svenska Vetensk. Acad. Handl., ser. 3, 16: 20, *t. 4, f. 4-5*. 1937.—Type. HAITI, **Sud-Est**: Massif de la Selle, Pétionville, northern slope of Morne La Visite, *Ekman H7989* (holotype: S; isotype: US!).

Amauropelta hydrophila (Fée) O. Alvarez, **comb. nov.** *Phegopteris hydrophila* Fée, Mém. Foug., 11. Hist. Foug. Antil. 56, *t. 13, f. 3*. 1866. *Polypodium* *hydrophilum* (Fée) Baker, Ann. Bot. (Oxford) 5: 456. 1891. *Dryopteris hydrophila* (Fée) C.Chr., Index Filic. 271. 1905. *Thelypteris hydrophila* (Fée) Proctor, Rhodora 61: 306. 1959 [1960].—Type. GUADELOUPE: 1861, *L'Herminier s.n.* (holotype: ?, not found at P [photos from P deposited at GH!, NY!, US!]; isotypes: BM [photo deposited at MICH!], IJ!).

Amauropelta inabonensis (Proctor) O. Alvarez, **comb. nov.** *Thelypteris inabonensis* Proctor, Amer. Fern J. 75: 61. 1985.—Type. PUERTO RICO, **Ponce**: Cordillera Central, Toro Negro State Forest, along headwaters of Río Inabón above high falls, *Proctor 40069* (holotype: US!; isotypes: IJ!, SJ).

Amauropelta intromissa (C.Chr.) O. Alvarez, **comb. nov.** *Dryopteris intromissa* C.Chr., Kongl. Svenska Vetensk. Acad. Handl., ser. 3, 16: 22. *t. 4, f. 9-10.* 1937.—Type. HAITI, **Sud-Est**: Morne La Selle, Marigot, Jardins Bois-Pin, *Ekman H 10060* (holotype: S; isotypes: IJ!, US!).

Amauropelta linkiana (C. Presl) O. Alvarez, **comb. nov.** *Grammitis linkiana* C. Presl, Tent. Pterid. 209. 1836. *Gymnogramma polypodioides* Link, Hort. Berol. [Link] 2: 50. 1833 (*non* Spreng. 1827) *nom. illeg. Leptogramma linkiana* (C. Presl) J. Sm., J. Bot. (Hooker) 4: 52. 1841. *Gymnogramma linkiana* (C. Presl) Kunze, Linnaea 18: 310. 1844. *Phegopteris linkiana* (C. Presl) Mett., Fil. Hort. Bot. Lips. 82. 1856. *Nephrodium linkianum* (C. Presl) Diels, Nat. Pflanzenfam. [Engler & Prantl] 1, Abt. 4: 172. 1899. *Dryopteris linkiana* (C.

Presl) Maxon, J. Wash. Acad. Sci. 14: 199. 1924. *Lastrea linkiana* (C. Presl) Copel., Gen. Fil. (Ann. Cryptog. Phytopathol. 5) 139. 1947. *Thelypteris linkiana* (C. Presl) R.M. Tryon, Rhodora 69: 6. 1967.—Type. Cultivated specimen, "H[ortus] B[erolinensis]", ex herb., *Link s.n.* (holotype: B [digital photo!]).

Amauropelta malangae (C.Chr.) O. Alvarez, **comb. nov.** *Dryopteris malangae* C.Chr., Kongl. Svenska Vetensk. Acad. Handl., ser. 3, 16: 21, *t. 6, f. 6-8*. 1937. *Thelypteris malangae* (C.Chr.) C.V. Morton, Amer. Fern J. 53: 66. 1963.—Type. HAITI, **Sud-Est**: Massif de la Selle, Grand Crête-a-Piquants, Port au Prince, Morne Malanga, *Ekman H5889* (holotype: S; isotypes: BM, US!).

Amauropelta muscicola (Proctor) O. Alvarez, **comb. nov.** *Thelypteris muscicola* Proctor, Rhodora 63: 33. 1961.—Type. NEVIS: Upper W slope of Nevis Peak, *Proctor 19354* (holotype: A!; isotypes: IJ!, U [digital photo!]).

Amauropelta namaphila (Proctor) O. Alvarez, **comb. nov.** *Thelypteris namaphila* Proctor, Amer. Fern J. 75: 56. 1985.—Type. PUERTO RICO, **San Germán**: Maricao State Forest, just S of Road 120 at approx. km 16.5, *Proctor 39834* (holotype: US!; isotypes: IJ!, SJ).

Amauropelta negligens (Jenman) O. Alvarez, **comb. nov.** *Nephrodium negligens* Jenman, Bull. Bot. Dept. Jamaica, n.s. 3: 21. 1896. *Dryopteris negligens*

(Jenman) C.Chr., Index Filic. 279. 1905. *Thelypteris negligens* (Jenman) Proctor, Amer. Fern. J. 71: 58. 1981.—Type. JAMAICA: From Jamaica without exact locality, 1891, *Jenman s.n.* (holotype: NY!).

Amauropelta oligocarpa var. ***navarrensis*** (H.Christ) O. Alvarez, **comb. nov.** *Aspidium navarrense* H.Christ, Bull. Herb. Boissier, sér. 2, 6: 160. 1906. *Dryopteris navarrensis* (H.Christ) H.Christ, Bull. Herb. Boissier, sér. 2, 7: 262. 1907. *Dryopteris oligocarpa* var. *navarrensis* (H.Christ) C.Chr., Index Filic., Suppl. 1906-1912. 36. 1913. *Thelypteris navarrensis* (H.Christ) Proctor, Bull. Inst. Jamaica, Sci. Ser. 5: 61. 1953. *Amauropelta navarrensis* (H.Christ) Pic. Serm., Webbia 31: 251. 1977.—Type. COSTA RICA, **Cartago**: Navarro, *Werckle s.n.* (holotype: P [digital photo!]; isotype: US!).

Amauropelta pachyrachis (Kunze ex Mett.) O. Alvarez, **comb. nov.** *Aspidium pachyrachis* Kunze ex Mett., Abh. Senckenberg. Naturf. Ges. 2: 367. 1858. *Lastrea pachyrachis* (Kunze ex Mett.) T. Moore, Index Fil. (T. Moore) 99. 1858. *Nephrodium pachyrachis* (Kunze ex Mett.) Hook., Sp. Fil. 4: 100. 1862. *Dryopteris pachyrachis* (Kunze ex Mett.) Kuntze, Revis. Gen. Pl. 2: 813. 1891. *Thelypteris pachyrachis* (Kunze ex Mett.) Ching, Bull. Fan Mem. Inst. Biol. Bot. 10: 253. 1941.—Type. VENEZUELA, **Mérida**: Merida, *Moritz 409* (holotype: B [digital photo!]; isotype: BM).

Amauropelta physematioides (Kuhn et H.Christ) O. Alvarez, **comb. nov.** *Aspidium physematioides* Kuhn et H.Christ, Bot. Jahrb. Syst. 24: 115. 1897. *Dryopteris physematioides* (Kuhn et H.Christ) C.Chr., Index Filic. 284. 1906.—Type. DOMINICAN REPUBLIC, **La Vega**: "Ad Valle Nuevo, in rupibus", *Eggers 2244* (lectotype designated here: B [photo deposited at US!]; isolectotype: US [fragment!]).

Amauropelta piedrensis* var. *heterotricha (Caluff & C. Sánchez) O. Alvarez, **comb. nov.** *Thelypteris piedrensis* var. *heterotricha* Caluff & C. Sánchez, Willdenowia 35: 161, *f. 2A-B*. 2005.—Type. CUBA, **Santiago de Cuba**: Gran Piedra, cañada debajo del centro turístico, *Sánchez et al. 71243* (holotype: HAJB!; isotypes: HAJB!, B [digital photo!], BSC [as *Caluff et al. 3515, 3516*]!).

Amauropelta piedrensis (C.Chr.) O. Alvarez **var. *piedrensis***, **comb. nov.** *Dryopteris piedrensis* C.Chr., Smithsonian Misc. Collect. 52: 372. 1909. *Thelypteris piedrensis* (C.Chr.) C.V. Morton, Amer. Fern J. 53: 69. 1963.—Type. CUBA, **Santiago de Cuba**: Gran Piedra, Oriente, *Maxon 4041* (holotype: US!; isotypes: NY!, GH!).

Amauropelta pteroidea (Klotzsch) O. Alvarez, **comb. nov.** *Polypodium pteroideum* Klotzsch, Linnaea 20: 389. 1847. *Phegopteris pteroidea* (Klotzsch) Mett., Abh. Senckenberg. Naturf. Ges. 2: 293. 1858. *Nephrodium pteroideum*

(Klotzsch) Diels, Nat. Pflanzenfam. [Engler & Prantl] 1, Abt. 4: 171. 1899. *Dryopteris pteroidea* (Klotzsch) C.Chr., Index Filic. 287. 1905. *Thelypteris pteroidea* (Klotzsch) R.M. Tryon, Rhodora 69: 8. 1967.—Type. COLOMBIA: "Galipan Columbiae", *Karsten 40* (lectotype chosen by Sánchez & al. 2006: 44: B [digital photo!]).

Amauropelta rheophyta (Proctor) O. Alvarez, **comb. nov.** *Thelypteris rheophyta* Proctor, Amer. Fern J. 75: 58, *f. 2.* 1985.—Type. PUERTO RICO, **Ponce**: Barrio Anón, along Río Inabón toward base of high falls, *Proctor 40042* (holotype: US!; isotypes: IJ!, S).

Amauropelta rivularioides (Fée) O. Alvarez, **comb. nov.** *Aspidium rivularioides* Fée, Crypt. Vasc. Bresil 1: 148, *t. 50, f. 1.* 1869. *Dryopteris rivularioides* (Fée) C.Chr., Hedwigia 46: 125. 1906. *Lastrea rivularioides* (Fée) Copel., Gen. Fil. (Ann. Cryptog. Phytopathol. 5) 140. 1947. *Thelypteris rivularioides* (Fée) Abbiatti, Revista Mus. La Plata 9: 19. 1958.—Type. BRAZIL: Unknown locality, *Glaziou 2358* (holotype: P; isotype: C).

Amauropelta rudis var. ***gradata*** (C.Chr.) O. Alvarez, **comb. nov.** *Dryopteris rudis* var. *gradata* C.Chr., Kongl. Svenska Vetensk. Acad. Handl., ser. 3, 16: 25. 1937.—Type. HAITI, **Sud-Est**: Massif La Selle, Mourne Malanga, *Ekman H5888* (holotype: S; isotypes: IJ!, US!).

Amauropelta rupestris (Klotzsch) O. Alvarez, **comb. nov.** *Leptogramma rupestris* Klotzsch, Linnaea 20: 415. 1847. *Gymnogramma rupestris* (Klotzsch) Kunze, Linnaea 23: 256. 1850. *Phegopteris rupestris* (Klotzsch) Mett., Fil. Hort. Bot. Lips. 82. 1856. *Dryopteris rupestris* (Klotzsch) C.Chr., Index Filic. 290. 1905. *Thelypteris rupestris* (Klotzsch) C.F. Reed, Phytologia 17: 310. 1968.—Type. VENEZUELA, **Aragua**: "Colonia Tovar Columbiae", *Moritz 241* (holotype: P [digital photo!]; isotypes: C, HBG [photos deposited at GH!, MICH!], P [digital photo!]).

Amauropelta rupicola (C.Chr.) O. Alvarez, **comb. nov.** *Dryopteris rupicola* C.Chr., Repert. Spec. Nov. Regni Veg. 15: 24. 1917; *non* Hosok. 1936, *nom. illeg.* *Thelypteris rupicola* (C.Chr.) Ching, Bull. Fan Mem. Inst. Biol. Bot. 10: 254. 1941.—Type. DOMINICAN REPUBLIC, **La Vega**: "ad Valle Nuevo, in rupibus", *Eggers 2157* (holotype: BM [digital photo!]; isotype: B [digital photo!]).

Amauropelta rustica (Fée) O. Alvarez, **comb. nov.** *Phegopteris rustica* Fée, Mém. Foug., 11. Hist. Foug. Antil. 55, *t. 13, f. 1.* 1866. *Polypodium rusticum* (Fée) Baker, Syn. Fil. (Hooker & Baker) 306. 1867. *Dryopteris rustica* (Fée) C.Chr., Index Filic. 290. 1905. *Thelypteris rustica* (Fée) Proctor, Rhodora 61: 306. 1959[1960].—Type. GUADELOUPE: From Ravine la Rose de Matèliane, 1861, *L'Herminier s.n.* (holotype: ?, not found at P).

Amauropelta scalpturoides* var. *glabriuscula (C. Sánchez & Caluff) O. Alvarez, **comb. nov.** *Thelypteris scalpturoides* var. *glabriuscula* C. Sánchez & Caluff, Willdenowia 35: 163, *f. 2C.* 2005.—Type. CUBA, **Holguín**: Moa, Parque Nacional "Alexandro de Humboldt" Meseta del Toldo a 3 km al N del campamento minero (pasando por la montaña "La Pelúa"), *Sánchez & Risco HFC 77885* (holotype: HAJB!; isotypes: B [digital photo!], BSC!).

Amauropelta scalpturoides (Fée) O. Alvarez **var. *scalpturoides*, comb. nov.** *Phegopteris scalpturoides* Fée, Mém. Foug., 11. Hist. Foug. Antil. 51-52. 1866. *Dryopteris scalpturoides* (Fée) C.Chr., Index Filic. 291. 1905. *Thelypteris scalpturoides* (Fée) C. F. Reed, Phytologia 17: 313. 1968.—Type. CUBA: Cuba Orientali 1856-7, *Wright 820* (lectotype chosen by Alvarez-Fuentes & Sánchez, 2005: 43: G-Herb. De Candolle!; isolectotypes: G[2]!, GH!).

Amauropelta sellensis (C.Chr.) O. Alvarez, **comb. nov.** *Dryopteris sellensis* C.Chr., Kongl. Svenska Vetensk. Acad. Handl., ser. 3, 16: 24, *t. 3, f. 7-8.* 1937.—Type. HAITI, **Sud-Est**: Massif de la Selle, high plateau of La Selle on the road Camp Franc-Saltron, *Ekman H3087* (holotype: S; isotypes: IJ!, US!).

Amauropelta shaferi (Maxon & C.Chr.) O. Alvarez, **comb. nov.** *Dryopteris shaferi* Maxon & C.Chr., Amer. Fern J. 4: 77. 1914. *Thelypteris shaferi* (Maxon & C.Chr.) Duek, Adansonia, ser. 2, 11: 719. 1972.—Type. CUBA, **Holguín**: "Oriente, vicinity of Camp San Benito", *Shafer 4037* (holotype: US!).

CHAPTER 4

A REVIEW OF THE GENUS *AMAUROPELTA* (THELYPTERIDACEAE) IN THE CARIBBEAN ISLANDS

ABSTRACT

This study proposes recognizing subgenus *Amauropelta* at the generic level. The genus *Amauropelta* (Thelypteridaceae) comprises at least 200 species, most of them occurring in the Neotropics with the exception of about 11 paleotropical species. *Amauropelta* is distinguished by the presence of simple foliar veins with the lowermost usually meeting the margins of segments distally to the sinuses, spores with a densely reticulate perispore, and a base chromosome number (*x*) of 29. The genus has been divided into nine sections: *Adenophyllum*, *Amauropelta*, *Apelta*, *Blennocaulon*, *Blepharitheca*, *Lepidoneuron*, *Pachyrachis*, *Phacelothrix*, and *Uncinella*. Based on morphological and phylogenetic data some species of sect. *Amauropelta* are transferred to a proposed new section: sect. *Scalpturata*. The taxonomic treatment focuses on the Caribbean species of the genus and is based mainly on herbarium studies, SEM studies of spore morphology, and field observations. Of the Neotropical *Amauropelta*, 57 taxa occur in the Caribbean Islands (50 species and 7 varieties), of which 41 are endemic to the area. Five of those taxa (3 species and 2 varieties) are described as new. The taxonomic treatment of the 57 taxa includes keys, general distribution data, and illustrations. Full descriptions are provided only for the novel taxa and, exceptionally, for *A. rupicola* because clarifying its status as a good species was necessary. New combinations are proposed for eight sections and one species is lectotypified.

INTRODUCTION

Thelypteridaceae is a cosmopolitan and large fern family of nearly 1,000 species distributed mostly in tropical and subtropical regions (Smith 1974, 1988, 1990; Tryon & Tryon 1982). It was recognized at family rank only in 1940 by Ching (Ching 1940; Holttum 1969, 1971, 1977; Pichi Sermolli 1970; Smith 1974). Members of the Thelypteridaceae are characterized by having two hippocampus-shaped vascular bundles at the base of the petioles that fuse into a single U-shaped strand distally (Figure 2); unicellular, acicular or branched hairs on the adaxial side of rachises, costae and laminar tissue; and by having rachises and costae adaxially sulcate, these sulci or grooves not continous from rachis to costa (Smith 1974, 1990; Holttum 1977).

Thelypteridaceae has a reputation as a taxonomically difficult family (Smith 1983b) due to the fact that species recognition requires the examination of several microscopic characters (Holttum 1973), but especially because of its convoluted nomenclatural history (see: Christensen 1907, 1913, 1920, 1937; Ching 1940; Morton 1963; Holttum 1969, 1971, 1973; Pichi Sermoli 1970; Smith 1971, 1983a, 1990; Walker 1973; Wood 1973; Tryon & Tryon 1982; Proctor 1985a, 1989; Lellinger 1985; Ponce 1987; Tryon & Lugardon 1991; Moran & Smith 2001; Smith & Cranfill 2002; Smith & al. 2006; Sánchez & al. 2006; Beaman & Edwards 2007; Schuettpelz & Pryer 2007).

There have been considerable studies of morphology (Christensen 1913, 1920; Holttum 1969, 1970, 1971, 1977; Smith 1971b, 1980, 1974, 1990), cytology (Smith 1971a; Walker 1973; Löve & al. 1977), palynology (Wood 1973; Tryon & Tryon 1982; Tryon & Lugardon 1991), and, more recently, phylogenetics (Smith & Cranfill 2002;

Schuettpelz & Pryer 2007; Alvarez-Fuentes [this dissertation, Chapter 2]) of the Thelypteridaceae. These data suggest the recognition of "natural" (i.e. monophyletic) groups within the family, however, the main problem within Thelypteridaceae resides in the lack of agreement on the recognition of such "natural" groups whether at generic or subgeneric levels by specialists (Holttum 1969, 1970; Smith 1971a, pers. comm.).

Most Neotropical thelypteroid species were first monographed under *Dryopteris* by Carl Christensen (1913, 1920), who recognized several "natural" groups as subgenera; these "natural" groups coincide more or less with those defined by later authors; however, before Christensen's monographs the taxonomic treatment of thelypteroid species did not agree among themselves nor with groups recognized today. The monumental work of Christensen (1907, 1913, 1920) constituted the starting point in the modern taxonomy of Thelypteridaceae.

Recent molecular studies based on the chloroplast gene *rbc*L (Hasebe & al. 1995; Pryer & al. 1995), combined chloroplast data from genes *rps*4, and the spacers *rps*4-*trn*S, and *trn*L-*trn*F (Smith & Cranfill 2002; Alvarez-Fuentes [this dissertation, Chapter 2]), and *rbc*L, *atp*B, and *atp*A (Schuettpelz & Pryer 2007), show the Thelypteridaceae to be monophyletic within an alliance that also includes families Aspleniaceae, Woodsiaceae, Onocleaceae, and Blechnaceae (Schuettpelz & Pryer 2007). The studies of Smith & Cranfill (2002) follow the taxonomy of Holttum (1971) while the studies of Schuettpelz & Pryer (2007) and Alvarez-Fuentes (this dissertation, Chapter 2) follow the taxonomy of Smith (1990), as modified by Smith & al. (2006).

This study focuses on one group within the Thelypteridaceae, currently recognized as subgenus *Amauropelta*. Smith (1990) included *Amauropelta* as a subgenus of a large and inclusive *Thelypteris*. As treated by Smith (1990), *Thelypteris s.l.* is paraphyletic (Smith & Cranfill 2002; Schuettpelz & Pryer 2007; Alvarez-Fuentes [this dissertation, Chapter 2]) suggesting that an improved taxonomic classification could be implemented. In order to recognize only monophyletic groups *Thelypteris* (sensu Smith 1990) could be split into multiple genera or other recognized genera (Smith 1990) could be subsumed into an even more inclusive *Thelypteris*.

Wood (1973) proposed the recognition of *Amauropelta* at the generic level based on studies of spore morphology for which he included several New World species; however, *Amauropelta* had not yet received recognition as a genus in the Neotropics (though it had in the Old World).

The following evidence and reasoning support recognition of *Amauropelta* at the generic rank, as Old World pteridologists have done: 1) molecular studies support the monophyly of *Amauropelta* (Schuettpelz & Pryer 2007; Alvarez-Fuentes [this dissertation, Chapter 2]); 2) *Thelypteris s.l.* is paraphyletic in reference to the cyclosoroids (Smith & Cranfill 2002; Schuettpelz & Pryer 2007; Alvarez-Fuentes [this dissertation, Chapter 2]) unless some changes are made in its taxonomy (such as the recognition of several genera currently included in *Thelypteris s.l.*, e.g., *Amauropelta*, *Coryphopteris*, *Metathelypteris*, *Parathelypteris*, and *Thelypteris s.s.*); 3) palynological studies (Wood 1973; Tryon & Tryon 1982; Tryon & Lugardon 1991) support monophyly of *Amauropelta* based on the characteristics of the spore's perispore which is densely reticulate; and 4) cytological studies have documented that *Amauropelta* is unique among members of the Thelypteridaceae by having a base chromosome number (x) of 29 (Smith 1971a; Walker 1973; Löve & al. 1977). The latter two characters, base chromosome number of 29 and spores with a densely reticulated perispore, appear to be potential synapormorphies for *Amauropelta* but further sampling within *Amauropelta* and close relatives is needed. Furthermore, this group has been considered "natural" based on the morphological similarity of its species which are also characterized by the presence of proximal pinnae that are usually reduced, and simple veins with the lowermost of them usually meeting the margins of segments distally to the sinuses (Proctor 1985b, 1989; Ponce 1987; Smith 1990).

There are at least 200 species in *Amauropelta*, most of them occurring in the Neotropics (Smith 1974; Holttum 1977; Proctor 1985a, 1989; Ponce 1987; Sánchez & al. 2006). Eight species have been described from Africa, Madagascar, and the Mascarene Islands, while three other species are endemic to the Pacific Islands of Hawaii, Tahiti, and Rapa (Holttum 1977). Fifty seven taxa, including five newly described here, occur in the Caribbean Islands (50 species and 7 varieties), of which 41 (72%) are endemic to the area. These high levels of endemism parallel those reported for flowering plant taxa in the Caribbean region (Santiago-Valentin & Olmstead 2004; Francisco-Ortega & al. 2007).

In this chapter several morphological characters previously used to define sections within *Amauropelta* are discussed in part 1 to clarify sectional boundaries. Part 2 is related to the taxonomy of *Amauropelta* in the Caribbean Islands and includes keys and a checklist for all Caribbean taxa of *Amauropelta*; they are listed within the sections to which they presumably belong. In addition to new combinations, I also provide a summary of diagnostic characters for each section. Six new taxa, including a new section, are described here. For the novelties I provide Latin diagnosis, types, descriptions, general distribution data, habitat, specimens examined, and discussions. An exception was made with *A. rupicola*, for which I also provide a description and specimens examined to clarify its status as a good species.

MATERIALS AND METHODS

General morphology. The present treatment is based on the study of ca. 3000 specimens (Appendix B) from those herbaria listed in the Acknowledgments. Herbarium abbreviations follow Holmgren & al. (1990; http://sweetgum.nybg.org/ih/). Several type specimens were examined in the form of digital images from the Virtual Herbaria of B ([18] Röpert 2000) and U (2), or kindly provided by curators (BM [1] and P [14]). All pteridological terms were standardized following Lellinger (2002). Field observations were made in Jamaica (August 2003), Ecuador (May 2004), Cuba (1997, May 2008), and Hispaniola (May-June 2008). I made an additional 145 collections (~346 specimens) representing 23 species of *Amauropelta*. Duplicates are deposited in five herbaria (IJ, JBSD, MSC, QCNE, and UC).

One hundred and fifty-seven different characters (137 qualitative and 34 quantitative) were measured or observed for each species (Appendix C). Measurements of 14 of the 34 quantitative characters were taken from digital images of herbarium specimens using the software tpsDIG2 ver. 2.12 (http://life.bio.sunysb.edu/morph/). These images were taken by placing the specimens on a copy stand with an attached Canon EOS digital Rebel XT camera with image-recording quality of 3456 x 2304 pixels. Other microscopic morphological measurements were taken directly from dried material using a graduated ocular micrometer scaled by using a slide micrometer. Data from herbarium specimen labels, such as rhizome types and plant height, were also collected and used.

Micromorphology (SEM). Sporangia, spores, indusia, glands, and hairs of select species were observed by scanning electron microscopy (SEM). Sporangia and spores were obtained from dried pinnae and attached, without pre-treatment, to stubs with double-sided carbon tape, coated under vacuum with gold-palladium for 4 minutes at 20 mA, and examined and photographed at 12 kV using a JEOL 6400 V SEM at the Center for Advanced Microscopy at Michigan State University. Vouchers are cited in figures.

Taxonomy. For each Caribbean species of *Amauropelta*, the homotypic and heterotypic synonyms that are relevant to the Caribbean area are included. Synonymy is based mainly on study of types and, where necessary, the list was complemented from various sources including literature, and the online databases TROPICOS (2008; http://www.tropicos.org) and the International Plant Names Index (IPNI, 2008; http://www.ipni.org). Authors and protologue abbreviations were standardized following the online database IPNI (Appendix D).

PART 1. SOME NOTES ON THE SECTIONAL CLASSIFICATION

The species of *Amauropelta* that occur in the Caribbean are included in nine sections (sensu Smith 1974): *Adenophyllum*, *Amauropelta*, *Apelta*, *Blennocaulon*, *Blepharitheca*, *Lepidoneuron*, *Pachyrachis, Phacelothrix*, and *Uncinella*. These sections were defined based on morphology alone.

One of the limitations of Smith's (1974) classification is that several species (e.g., *A. rupicola*, *A. scalpturoides*, and *A. physematioides*) cannot be placed within the existing sectional boundaries.

Some morphological characters used by Smith (1974) to define his sections are found in species from other sections and hence they are ambiguous, e.g., presence of indusia and hair type (Figures 2, 6). These problems have been noted by others, e.g., Smith (1974), Proctor (1985a), and Ponce (1987). There are, however, a few characters that define better some sections than others, e.g., presence of fasciculate hairs on vascular parts (sect. *Phacelothrix*), presence of uncinate hairs on laminar tissue and axes (sect. *Uncinella*), presence of mucilage covering croziers and rhizome apices (sect. *Blennocaulon*), and the presence of clathrate scales more than two cells wide on the abaxial costae (sect. *Lepidoneuron*). These characters still can occur in species outside the sections that they define. For example, the presence of uncinate or hamate hairs in laminar tissue and axes is a reliable character that defines sect. *Uncinella*; uncinate hairs, however, also occur in *A. rudis* (sect. *Lepidoneuron*).

Further study of morphological variation in combination with phylogenetic results could result in an improved sectional classification (Figure 7). Moreover, preliminary phylogenetic results (Schuettpelz & Pryer 2007; Alvarez-Fuentes [this dissertation, Chapter 2]) also suggest that the sections are not monophyletic, and they need more thorough study.

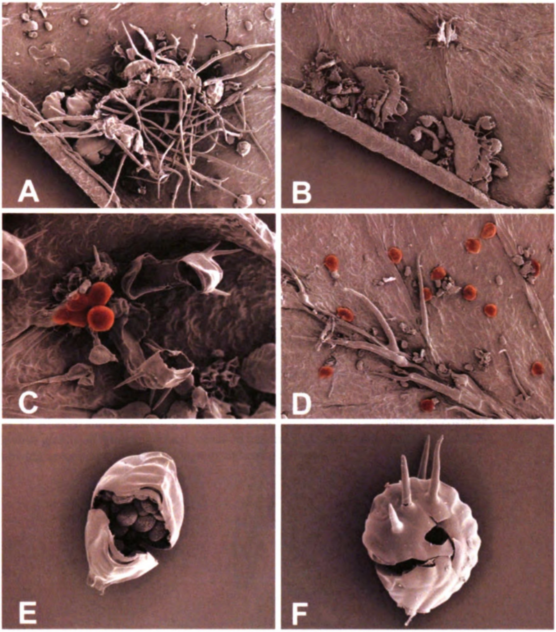
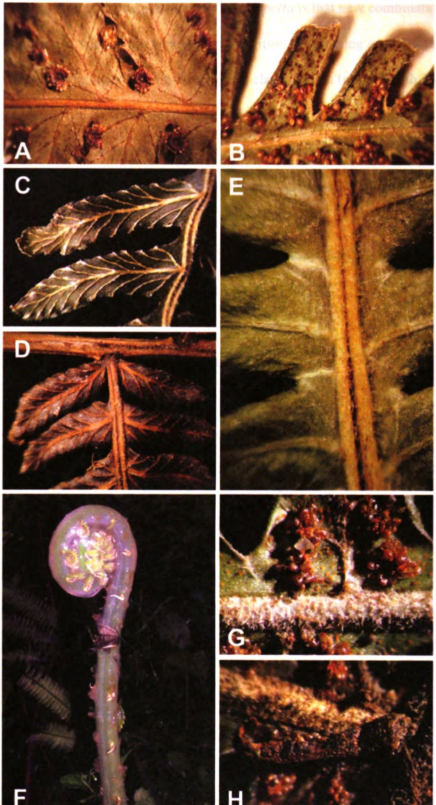


Figure 6. SEM images of micromorphology of *Amauropelta*. A-C. Indusia types. A. *A. gracilenta* (*Clute 173*). B. *A. shaferi* (*Ekman 5747*). C. *A. firma* (*Maxon 10005*). D. Abaxial laminar surface of *A. gracilenta* (*Clute 173*) showing hairs and globular glands (artificially colored). E, F. Sporangia vestiture. E. Glabrous. *A. balbisii* var. *balbisii* (*Proctor 16902*). F. Setulose. *A. firma* (*Maxon 10005*).

Figure 7. Macromorphology of *Amauropelta.* A, B. Abaxial laminar surface showing venation pattern, sori, indusial, and sessile globular glands. A. *A. limbata* (*Britton & Cowell 397*). B. *A. resinifera* (*Underwood 3236*). C-E. Position of veins relative to adaxial laminar surface. C, D. Prominent. C. *A. rupicola* (*Alvarez-Fuentes & Clase 699*). D. *A. firma* (*Alvarez-Fuentes et al. 556*). E. Complanate. *A. cheilanthoides* (*Alvarez-Fuentes & Clase 658*). F-H. *A. thomsonii* (*Alvarez-Fuentes & Clase 663*). F. Mucilage covered crozier showing protruding (whitish) aerophores. G. Abaxial surface showing fasciculate hairs on costa, small aerophore on costular base, yellowish glands on laminar surface, venation pattern, sori, and sporangia. H. Abaxial surface showing aerophores at pinna (elongate) and costular bases.


A
B
C
D
E
F
G
H

A consequence of the recognition of *Amauropelta* is that new combinations for the sections and many species are necessary. In addition to renaming sections, the sole change in sectional circumscription from the prior classification (sensu Smith 1974) was made in sect. *Amauropelta* where several species, characterized by veins prominently raised adaxially and by the presence of free pinnules at the bases of medial pinnae, were designated to a newly erected section described here.

PART 2. TAXONOMIC TREATMENT, KEY, NEW COMBINATIONS, AND DESCRIPTION OF NEW SPECIES

Amauropelta Kunze

Amauropelta Kunze, Farrnkräuter 1: 86. 1843. *Thelypteris* subg. *Amauropelta* (Kunze) A.R. Sm., Amer. Fern J. 63: 121. 1973.—Type: *Amauropelta breutelii* Kunze [≡ *Amauropelta limbata* (Sw.) Pic. Serm.]

Terrestrial. *Rhizomes* suberect to erect, sometimes long- or short-creeping, with more or less pubescent or glandular scales at the apices. *Leaves* monomorphic; *petioles*, *rachises*, and *costae* adaxially sulcate; *laminae* pinnate to usually pinnate-pinnatifid, proximal pinnae usually reduced, sometimes nearly to rhizomes; *laminar tissue* glabrescent or commonly pubescent, hairs acicular (unicellular or multicellular), uncinate, or sometimes fasciculate but never forked or stellate. *Aerophores* present at pinna bases, or absent; *segments* with fewer than 23 pairs of veins; *veins* usually simple, occasionally furcate, lowermost usually meeting margins of segments always distal to the sinuses. *Sori* round or elliptical, occasionally somewhat elongate, mostly medial on veins; *indusia* often present, usually round or reniform; *spores* monolete, reniform, with sporoderm finely reticulate. *Base chromosome* number $x = 29$ (description modified from Smith 1981b, 1988).

KEY TO THE CARIBBEAN SPECIES OF *AMAUROPELTA*

1. Hairs of rachises and costae abaxially fasciculate; aerophores present at bases of costules abaxially, elongated and obvious .... 1. *A. thomsonii*
1. Hairs of rachises and costae abaxially simple, never fasciculate; aerophores at bases of abaxial costules generally absent, if present, at basal segments only, usually small and obscure 2
    2. Laminae 2-pinnate in proximal and medial portion, with more than 8 pairs of free pinnules in medial pinnae 3
        3. Leaves creeping, > 70 cm long (up to 3 m long); pinnules 6-7.5 cm long; sporangia glabrous .... 2. *A. pteroidea*
        3. Leaves erect, < 70 cm long; pinnules 1-2 cm long; sporangia setulose .... 23. *A. aliena*
    2. Laminae 1-pinnate to pinnate-pinnatifid, if 2-pinnate with up to 8 pairs of free pinnules in medial pinnae 4
        4. Indusia absent or, if present, decidous, small and obscure (except in *A. rheophyta*, *A. namaphylla*, *A. scalpturoides*, *A. basisceletica*, *A. piedrensis*, and *A. basiattenuatta* which are large and obvious) with the following characteristics: a tuft of hairs, or a

small lobe of tissue, pilose and/or glandular, or linear and completely obscured by sessile, globular glands 5

5. Sporangia setulose 6

   6. Rhizomes long-creeping; leaves distant to each other; indusia linear and erect (but completely obscured by sessile, globular glands) .... 24. *A firma*

   6. Rhizomes suberect to erect; leaves ascending in fascicles; indusia vestigial or absent 7

      7. Indusia vestigial, of tufted hairs; laminae pinnate-pinnatifid; segments well defined in deeply dissected pinnae .... 20. *A. concinna*

      7. Indusia absent; laminae 1-pinnate; segments not defined in nearly entire pinnae .... 25. *A. manaiorum*

5. Sporangia glabrous 8

   8. Uncinate (hamate) hairs present on abaxial side of laminae 9

      9. Rachises bearing small proliferous bulbils at axils of some distal pinnae 10

         10. Petioles and rachises densely furnished with short acicular hairs fully appressed and directed proximally; costae abaxially with at least a few deciduous, clathrate scales at costular bases; aerophores at abaxial pinna bases absent .... 5. *A. rupestris*

         10. Petioles and rachises pubescent but hairs neither appressed, nor directed proximally; costae abaxially lacking scales; aerophores at abaxial pinna bases present .... 6. *A. linkiana*

      9. Rachises lacking proliferous bulbils at axils of pinnae 11

         11. Laminar tissue abaxially covered by both acicular and uncinate hairs; sericeous pubescence in abaxial costae and costules; costal scales present abaxially .... 4a. *A. rudis* var. *rudis*

11. Laminar tissue abaxially covered only by uncinate hairs or glabrous; lacking sericeous pubescence in abaxial costae and costules; costal scales absent abaxially 12

12. Sori elongate along veins 13

13. Laminar tissue abaxially bearing numerous sessile, globular and yellowish to reddish glands; rachises densely hispid on all sides, all hairs acicular, hairs $\leq$ 0.1 mm long; laminar tissue adaxially conspicuously hirsute, hairs $\leq$ 0.1 mm long .... 7. *A. consimilis*

13. Laminar tissue abaxially lacking glands, or else bearing only few sessile, globular and yellowish to reddish glands; rachises densely pubescent but all hairs uncinate, hairs > 0.1 mm long; laminar tissue adaxially hirsute or strigulose, hairs > 0.1 mm 14

14. Indusia vestigial, ciliate and globular-glandular; aerophores at abaxial pinna bases, if present, clavate and covered by uncinate hairs; veins dark olivaceous to blackish; basal segments elongate and overlapping those of adjacent pinnae .... 8. *A. gracilis*

14. Indusia absent; aerophores at abaxial pinna bases, if present, elongate and glabrous; veins mostly stramineous; basal segments reduced and never overlapping those of adjacent pinnae .... 9. *A. heteroclita*

12. Sori round or ovate along veins 15

15. Rachises and costae abaxially densely pubescent, with long and robust acicular hairs, 0.7-1.5 mm long; whitish septate

hairs present or not; veins and costules adaxially furnished with long and robust hairs similar to those on the abaxial side; laminar tissue adaxially bearing sessile, globular yellowish glands 16

16. Costae abaxially densely covered by long septate hairs, 4-5 cells per hair ..... 10b. *A. oligocarpa* var. *navarrensis*

16. Costae abaxially lacking long septate hairs, or if multicellular hairs present, with no more than 3 cells per hair .... 10a. *A. oligocarpa* var. *oligocarpa*

15. Rachises and costae abaxially densely or sparsely pubescent, lacking long and robust acicular hairs, hairs $\leq$ 0.4 mm long; whitish septate hairs always absent; veins and costules lacking long and robust hairs; laminar tissue adaxially eglandular 17

17. Aerophores at abaxial pinna bases deltate-elongate, sometimes coiled; laminae abruptly reduced proximally with more than 6 pairs of reduced pinnae .... 13. *A. germaniana*

17. Aerophores at abaxial pinna bases small, clavate; laminae gradually reduced proximally with fewer than 6 pairs of reduced pinnae 18

18. Indusia small, reduced to a lobe of tissue; most basal reduced proximal pinnae deltate-pinnatifid; pinnae sessile and equilateral with basal acroscopic segments about the same size as the basal basiscopic ones; segments linear-oblong, acute at apices, with >

15 pairs per pinnae, to 25 pairs on larger pinnae; rachises densely pubescent abaxially, hairs mostly acicular, with small capitate glands; abaxial laminar tissue densely pubescent; petioles and proximal third of rachises dark brown and matte, distal section of rachises stramineous .... 11. *A. intromissa*

18. Indusia absent; most basal reduced proximal pinnae auriculiform; pinnae subpetiolate and inequilateral with basal acroscopic segments larger than the basiscopic ones, this more evident at laminar bases; segments oblong-orbicular, rounded at apices, with up to 10 pairs per pinnae; rachises sparsely pubescent abaxially, hairs all uncinate, lacking small capitate glands; abaxial laminar tissue glabrous; petioles and proximal third of rachises atropurpureous and somewhat lustrous, distal section of rachises light brown .... 12. *A. negligens*

8. Uncinate (hamate) hairs absent 19

19. Abaxial costal scales present 20

20. Rhizome apices and croziers copiously mucilaginous; aerophores at abaxial pinna bases bacilliform and dark brown; rachises and laminae abaxially bearing numerous yellowish capitate glands; segment margins strongly revolute and covering the sori ....
.... 21. *A. cheilanthoides*

20. Rhizome apices and croziers not mucilaginous; aerophores at abaxial pinna bases usually absent, if present, clavate and light

brown; rachises and laminae abaxially lacking capitate yellowish glands; segment margins entire or slightly revolute, not covering the sori 21

21. Rhizomes long-creeping only; leaves growing distant to each other, not in fascicles; veins on both sides strongly prominent .... 4b. *A. rudis* var. *gradata*

21. Rhizomes long-creeping, or suberect, or erect; leaves growing in fascicles; veins on both sides essentially flat 22

22. Rachises and laminar tissue abaxially pubescent; abaxial costae and costules with sericeous pubescence; abaxial costules conspicuously raised; aerophores at abaxial pinna bases present; rhizome scales light brown, pubescent; 6-9 pairs of reduced proximal pinnae .... 4a. *A. rudis* var. *rudis*

22. Rachises and laminar tissue abaxially glabrous; abaxial costae and costules glabrescent; abaxial costules flat, or slightly raised; aerophores at abaxial pinna bases absent; rhizome scales dark brown to atropurpureous, glabrous; 0-1 pair of reduced proximal pinnae .... 19. *A. sellensis*

19. Abaxial costal scales absent 23

23. Laminae pinnate or pinnate-pinnatifid, lacking free pinnules 24

24. Rhizomes long-creeping; leaves growing distant to one another 25

25. Petioles longer than laminae, atropurpureous, lustrous; laminae 1-pinnate, segments not defined in nearly entire pinnae; rachises pubescent only at margins of adaxial sulci;

fully appressed scales present on rachises abaxially ....
.... 26. *A. ekmanii*

25. Petioles shorter than laminae, darker proximally to olivaceous distally, matte; laminae pinnate-pinnatifid; segments well defined in deeply dissected pinnae; rachises densely hispid on all sides; scales absent on rachises abaxially .... 24. *A. firma* (only those from Hispaniola)

24. Rhizomes suberect; leaves fasciculate 26

26. Leaves linear-lanceolate; laminae 1-pinnate, segments not defined in nearly entire pinnae; costae glabrous adaxially; rhizome scales deltate-lanceolate, densely pubescent, with margins entire; indusia vestigial, sometimes reddish-glandular .... 25. *A. manaiorum*

26. Leaves oblong-lanceolate or deltate-lanceolate; laminae pinnate-pinnatifid; segments well defined in deeply dissected pinnae; costae densely pubescent adaxially; rhizome scales linear-lanceolate, glabrescent, with margins toothed; indusia small, erect and ciliate, attached laterally on veins, eglandular .... 3. *A. muscicola*

23. Laminae bipinnate-pinnatifid, with free pinnules at least proximally on the larger pinnae 27

27. Leaves subsessile; reduced proximal pinnae 15-28 pairs 28

28. Reduced proximal pinnae irregularly stellate-laciniate, to 28 pairs; rhizome scales pubescent, lanceolate-acuminate to linear-lanceolate with narrow bases; indusia present, persistent, ciliate, pubescent and glandular; petioles and

rachises pubescent on all sides; rhizomes suberect to erect
.... 27. *A. basisceletica*

28. Reduced proximal pinnae deltate with three pinnatifid lobes, to 20 pairs; rhizome scales glabrous, lanceolate-acuminate with broad bases; indusia absent or reduced to a small lobe of tissue, sparsely hairy; petioles and rachises densely pubescent on adaxial sulci only, or else glabrescent; rhizomes creeping .... 28. *A. deminuta*

27. Leaves petiolate; reduced proximal pinnae 1-14 pairs 29

29. Leaves creeping; largest pinnae $\leq$ 3 cm; laminar tissue always glandular abaxially 30

30. Hairs on costae abaxially $\leq$ 0.2 mm long, generally of a single type on laminae and axes: acicular, 0.05-0.2 mm long; pinnae short stalked; indusia large, reniform, ciliate and marginally globular-glandular ....
.... 29. *A. basiattenuata*

30. Hairs on costae abaxially 0.4-0.6 mm long, generally of two types on laminae and axes: acicular, 0.1-0.2 mm long, and ciliform 0.4-0.6 mm long; pinnae sessile; indusia small, linear, glabrous and marginally globular-glandular .... 48. *A. glutinosa*

29. Leaves erect or falcate, never creeping; largest pinnae usually > 3 cm; laminar tissue glandular or eglandular abaxially 31

31. Laminar texture herbaceous to papyraceous; pinnae strongly or rather inequilateral mainly at bases, basal

acroscopic segments larger than the basal basiscopic ones 32

32. Scales at bases of petioles linear-lanceolate, pubescent and eglandular at margins; veins strongly raised on both sides of pinnae; laminae fully 2-pinnate with up to 8 pairs of non-decurrent pinnules .... 30. *A. namaphila*

32. Scales at bases of petioles ovate to bullate, glabrescent and glandular at margins; veins somewhat raised adaxially but never abaxially; laminae 2-pinnate at bases only with up to 2 pairs of non-decurrent pinnules 33

33. Aerophores at abaxial pinna bases absent; scales at bases of petioles ovate and clathrate; indusia small, mostly deciduous at maturity, with a few hairs and always marginally globular-glandular; distal pinna segments oblong .... 31. *A. sancta*

33. Aerophores at abaxial pinna bases present; scales at bases of petioles bullate and subclathrate; indusia large, persistent, short ciliate and sometimes marginally globular-glandular; distal pinna segments falcate .... 32. *A. rheophyta*

31. Laminar texture coriaceous; pinnae more or less equilateral on all sides, basal acroscopic segments equal or slightly larger than the basal basiscopic ones 34

34. Rachises and costae densely hispid on all sides, hairs ≤ 0.1 mm long 35

35. Indusia globular-glandular 36

36. Free pinnules 1 pair only; basal basiscopic segments 1-auriculate, with slightly-crenate margins; veins mostly simple, rarely bifurcate, thin, 0.03-0.06 mm wide, somewhat raised abaxially .... 34a. *A. piedrensis* var. *piedrensis* (see couplet 58 for Cuban varieties)

36. Free pinnules 2-8 pairs; basal basiscopic segments biauriculate, with dentate margins; veins mostly bifurcate, thick, 0.08-0.15 mm wide, prominently raised abaxially .... 34c. *A. piedrensis* var. *quisqueyana*

35. Indusia eglandular 37

37. Basal pinnules at medial pinnae smaller than the rest; basal basiscopic pinnules biauriculate; aerophores at abaxial pinna bases present; pinnae broad, 2-2.5 cm wide; distance between pinnae 2-3.6 cm; pattern of pinnae reduction with most distal pair of reduced proximal pinnae one to two times

smaller than pinnae pair immediately above; petioles densely hispid on all sides, bisulcate adaxially .... 35. *A. hastiloba*

37. Basal pinnules at medial pinnae slightly larger than the rest; basal basiscopic pinnules auriculate; aerophores at abaxial pinna bases absent; pinnae narrow, 0.5-1 cm wide; distance between pinnae 1.5-2 cm; pattern of pinnae reduction with most distal pair of reduced proximal pinnae three times smaller than pinnae pair immediately above; petioles densely hispid mainly at bases, glabrescent abaxially in distal portions, monosulcate adaxially .... 38. *A. rupicola*

34. Rachises and costae pubescent only on adaxial sulci, or else densely pubescent with interspersed long hairs on all sides, small hairs ≤ 0.1 mm long, long hairs 0.15-0.4 mm long 38

38. Indusia large, persistent, reniform, densely pubescent with hairs 0.4-0.6 mm long, or ciliate with few hairs; veins thin adaxially, 0.04-0.06 mm wide; Cuba .... 36. *A. scalpturoides* (see couplets 59, 67 and 72 for Cuban varieties)

38. Indusia small, deciduous, reduced to a lobe of tissue, with few hairs 0.04-0.3 mm long; veins

thick adaxially, 0.08-0.12 mm wide; Hispaniola 39

39. Reduced proximal pinnae deltate or deltate-pentalobate, with margins dentate-cuspidate; reduced proximal pinna axes (costae, costules and veins) of more or less equal thickness, basal veins arising at bases of costae, some bifurcate proximally, giving the appearance of a palmately-pinnate leaf; rhizome scales deltate-lanceolate, bases broad and sometimes folded at bases; petioles and rachises glabrous except for some long hairs along adaxial sulci .... 37. *A. flabellata*

39. Reduced proximal pinnae deltate-trilobate, with margins crenate or slightly crenate but tips not cuspidate; reduced proximal pinna costae thicker than costules, the latter thicker than veins, basal veins not always arising at bases of costae and venation pattern not appearing palmately-pinnate; rhizome scales lanceolate to linear-lanceolate, never folded at bases; petioles and rachises densely pubescent, if glabrous abaxially then densely pubescent along adaxial sulci .... 38. *A. rupicola*

4. Indusia present, persistent, large and obvious, with the following characteristics: round or reniform, glabrous or variously pubescent and/or glandular, or somewhat linear but never obscured by sessile, globular glands 40

40. Uncinate (hamate) hairs present on abaxial side of laminae 41

41. Rachises bearing small proliferous bulbils at bases of some distal pinnae .... 13. *A. germaniana*

41. Rachises lacking proliferous bulbils in pinna axils 42

42. Scales present on rachises and/or costae 43

43. Main leaf axes densely covered in scales from petiole bases to distal pinnae 44

44. Rhizomes suberect to erect; leaves fasciculate; scales linear with entire margins, pubescent, dark brown and lustrous; hairs on rachises and costae abaxially long.acicular, none uncinate, ≤ 1 mm long; sori supramedial to submarginal on veins; indusia pubescent with both acicular and uncinate hairs; aerophores at abaxial pinna bases small, clavate, blackish and acicular-setulose .... 14. *A. inabonensis*

44. Rhizomes long-creeping; leaves distant to one another; scales cymbiform with erose margins, glabrous, castaneous, either lustrous or matte; hairs on rachises and costae abaxially long-uncinate, 0.5-0.7 mm long; sori pericostal to inframedial on veins; indusia pubescent with uncinate hairs only; aerophores at abaxial pinna bases large, deltate-acuminate, dark brown and uncinate-setulose .... 15. *A. rustica*

43. Main leaf axes sparsely scaly 45

45. Laminar tissue abaxially covered by both acicular and uncinate hairs; pubescence on abaxial costae and costules sericeous; abaxial costules conspicuously raised; costal scales present abaxially .... 4a. *A. rudis* var. *rudis*

45. Laminar tissue abaxially covered only by uncinate hairs, or glabrous; pubescence on abaxial costae and costules hirsute; abaxial costules complanate; costal scales absent abaxially .... 13. *A. germaniana*

42. Scales essentially absent from rachises and costae 46

46. Aerophores at abaxial pinna bases elongate, obvious; abaxial hairs all uncinate (including indusial hairs); petioles atropurpureous proximally; veins 2-5 pairs on largest segments ..... 16. *A. hydrophila*

46. Aerophores at abaxial pinna bases absent, or if present clavate and obscure; abaxial hairs uncinate and acicular (including indusial hairs); petioles dark gray proximally; veins 6-11 pairs on largest segments 47

47. Rachises and costae abaxially densely pubescent with long and robust acicular hairs, 0.7-1.5 mm long; whitish septate hairs present or not; veins and costules adaxially furnished with long and robust hairs similar to those on the abaxial side; laminar tissue adaxially globular-glandular; laminae abruptly reduced proximally, up to 6 pairs of reduced pinnae 48

48. Abaxial costae densely covered by long septate hairs, 4-5 cells per hair .... 10b. *A. oligocarpa* var. *navarrensis*

48. Abaxial costae lacking long septate hairs, or if multicellular hairs present, with no more than 3 cells per hair .... 10a. *A. oligocarpa* var. *oligocarpa*

47. Rachises and costae abaxially sparsely pubescent, lacking long and robust acicular hairs, hairs ≤ 0.4 mm long; whitish septate hairs always absent; veins and costules adaxially lacking long and robust hairs; laminar tissue adaxially eglandular; laminae gradually reduced proximally, up to 12 pairs of reduced pinnae 49

49. Rachises minutely pubescent abaxially, hairs 0.05-0.1 mm long; basal segments longer than the rest; segments with truncate apices and margins revolute; veins 5-7(-9) pairs on largest segments; reduced proximal pinnae to 6 pairs; indusia pubescent, if ciliate, hairs uncinate and acicular; laminar tissue abaxially pubescent or glabrescent ..... 17. *A. antillana*

49. Rachises sparsely pubescent abaxially, hairs 0.2-0.4 mm long; basal segments smaller than the rest, or the basal acroscopic ones larger and basal basiscopic ones smaller; segments with round to acute apices and margins undulate, not revolute; veins 7-11 pairs on largest segments; reduced proximal pinnae to 12 pairs; indusia ciliate, hairs all uncinate; laminar tissue abaxially always pubescent .... 18. *A. scalaris*

40. Uncinate (hamate) hairs absent 50

50. Veins strongly or rather prominent adaxially (except *A. consanguinea*) ... 51

51. Laminae bipinnate-pinnatifid, with free pinnules at least proximally on larger pinnae 52

52. Leaves subsessile; reduced proximal pinnae irregularly stellate-laciniate and skeletal near rhizomes, 15-28 pairs .... 27. *A. basisceletica*

52. Leaves distinctly petiolate; reduced proximal pinnae trilobate, deltate-pinnatifid or lanceolate-pinnatifid, none skeletal, 1-14 pairs 53

53. Leaves creeping; largest pinnae no longer than 3 cm; stalked globular glands on laminar tissue adaxially .... 29. *A. basiattenuata*

53. Leaves erect or falcate, none creeping; largest pinnae usually > 3 cm; sessile globular glands on laminar tissue adaxially, or eglandular 54

54. Laminae herbaceous to papyraceous; pinnae strongly or rather inequilateral mainly at bases; basal acroscopic segments distinctly larger than the basal basiscopic ones 55

55. Scales at bases of petioles linear-lanceolate, pubescent and eglandular; veins strongly raised on both sides; laminae fully 2-pinnate with up to 8 pairs of non-decurrent pinnules .... 30. *A. namaphila*

55. Scales at bases of petioles ovate to bullate, glabrescent and glandular at margins; veins somewhat raised adaxially but never abaxially; laminae 2-pinnate at

bases, with up to 2 pairs of non-decurrent pinnules 56

56. Aerophores at abaxial pinna bases absent; scales at bases of petioles ovate and clathrate; indusia small, mostly deciduous at maturity, with few hairs and marginally globular-glandular; distal pinna segments oblong .... 31. *A. sancta*

56. Aerophores at abaxial pinna bases present; scales at bases of petioles bullate and subclathrate; indusia large, persistent, short ciliate and sometimes marginally globular-glandular; distal pinna segments falcate .... 32. *A. rheophyta*

54. Laminae chartaceous to strongly coriaceous; pinnae more or less equilateral on all sides; basal acroscopic segments equal or slightly larger than the basal basiscopic ones 57

57. Laminae abruptly reduced proximally with up to 5 pairs of reduced pinnae; laminar tissue abaxially eglandular or bearing sessile, reddish or yellowish, globular glands; veins (6-)7-10 pairs per segment; indusia globular-glandular, sparsely pubescent, hairs 0.1-0.3 mm long 58

58. Rachises and costae abaxially always with long, stiff hairs interspersed on all sides, small hairs to 0.1 mm long, long hairs to 0.9 mm long; abaxial laminar tissue glabrous and eglandular; basal basiscopic segments of largest pinnae strongly auriculate;

auricles recurved and completely overlapping

rachises .... 34b. *A. piedrensis* var. *heterotricha*

58. Rachises and costae abaxially with hairs homogeneous in size, to 0.1 mm long; abaxial laminar tissue pubescent and globular-glandular; basal basiscopic segments of largest pinnae subauriculate; auricles small and barely overlapping rachises .... 34a. *A. piedrensis* var. *piedrensis*

57. Laminae gradually reduced proximally with 6-14 pairs of reduced pinnae; laminar tissue abaxially lacking sessile, globular glands; veins 4-6(-7) pairs per segment; indusia eglandular, densely pubescent, hairs > 0.3 mm long 59

59. Rachis hairs homogeneous in size, 0.1-0.4 mm long; laminae glabrescent abaxially, glabrous or sparsely strigulose adaxially .... 36b. *A. scalpturoides* var. *glabriuscula*

59. Rachis hairs not homogeneous in size, larger hairs up to 1 mm long; laminae pubescent abaxially, densely strigose adaxially .... 36a. *A. scalpturoides* var. *scalpturoides*

51. Laminae pinnate or pinnate-pinnatifid, lacking free pinnules 60

60. Laminar tissue abaxially or indusia margins bearing sessile, reddish globular glands 61

61. Leaves subsessile; reduced proximal pinnae irregularly stellate-laciniate and skeletal near rhizomes, 15-28 pairs .... 27. *A. basisceletica*

61. Leaves distinctly petiolate; reduced proximal pinnae trilobate, deltate-pinnatifid or lanceolate-pinnatifid, none skeletal, 3-14 pairs 62

62. Laminae herbaceous to papyraceous; pinnae strongly inequilateral mainly at bases; basal acroscopic segments distinctly larger than the basal basiscopic ones 63

63. Rhizome apices densely clothed by a tuft of scales; scales deltate-lanceolate, with clathrate cells longer than broad; aerophores at pinna bases obviously present, somewhat elongate; proximal half of petioles blackish .... 44. *A. consanguinea*

63. Rhizome apices with few scales; scales ovate to broadly ovate-bullate, with clathrate cells nearly isodiametric; aerophores at pinna bases absent, or if present, very small and obscure; proximal half of petioles mostly stramineous 64

64. Laminae, rachises, and costae abaxially densely pubescent; hairs 0.4-1.5 mm long; indusia densely pubescent .... 31. *A. sancta*

64. Laminae, rachises, and costae abaxially sparsely pubescent; hairs up to 0.5 mm long; indusia with few hairs only 65

65. Aerophores at abaxial pinna bases absent; scales at bases of petioles ovate and clathrate, glandular at margins; indusia small and mostly deciduous at maturity, with few hairs and marginally globular-glandular; segments linear-oblong, rarely falcate, widely separated by more than their own width .... 31. *A. sancta*

65. Aerophores at abaxial pinna bases present; scales at bases of petioles broadly ovate-bullate and subclathrate, eglandular at margins; indusia large and persistent, short ciliate and sometimes marginally globular-glandular; segments oblong-falcate, separated by narrow sinuses no larger than their own width .... 32. *A. rheophyta*

62. Laminae chartaceous to strongly coriaceous; pinnae essentially equilateral on all sides; basal acroscopic segments equal or slightly larger (or smaller) than the basal basiscopic ones 66

66. Costules and veins of both laminar sides with long, stiff hairs, 0.5-1.5 mm long; laminar tissue lacking hairs on both sides, densely globular-glandular abaxially; rhizome scales lanceolate and glabrescent .... 39. *A. gracilenta*

66. Costules and veins of both laminar sides lacking long, stiff hairs, if rigid hairs present, ≤ 0.3 mm long; laminar tissue on both sides variously pubescent or at least

pubescent on the adaxial side, densely to sparsely globular-glandular abaxially; rhizome scales lanceolate or linear-lanceolate, pubescent 67

67. Laminae narrowly lanceolate; distance between costa-sinus $\geq$ 0.9 mm; veins 4 pairs at basal segments, if veins free, then 1 to 4 pairs per segment, otherwise costules bifurcate and reaching segment margins distal to the sinuses; pinnae hastate at bases, basal segments two times larger than the second pair of segments; rhizome scales linear-lanceolate; abaxial laminar tissue densely pubescent .... 36c. *A. scalpturoides* var. *angustifolia*

67. Laminae broadly lanceolate; distance between costa-sinus < 0.7 mm; veins 5-7 pairs at basal segments, most veins free, 4-7 pairs per segment, some veins bifurcate but not the costules; pinnae not hastate at bases although basal segments are slightly elongate, basal segments slightly larger than the second pair of segments, never twice as long; rhizome scales linear-lanceolate to lanceolate with broad bases; abaxial laminar tissue densely pubescent to glabrous 68

68. Rhizome scales linear-lanceolate, pubescent; laminae sparsely globular-glandular abaxially, glands mostly at veins, costules and indusia; adaxial rachises and bases of costae sometimes

bearing hyaline capitate glands; laminar tissue abaxially densely pubescent to glabrescent, if pubescent, then hair density thin; Cuba .... 36a. *A. scalpturoides* var. *scalpturoides*

68. Rhizome scales lanceolate with broad bases, rather glabrescent; laminae densely globular-glandular abaxially, glands on laminar tissue, axes and indusia; adaxial rachises and bases of costae minutely covered by yellowish capitate glands; laminar tissue abaxially always densely pubescent, hair density thick; Jamaica .... 40. *A. nockiana*

60. Laminar tissue abaxially or indusia margins lacking sessile, globular glands, or if glands present they are yellowish or rather translucent capitate glands 69

69. Laminae 1-pinnate; pinnae hastate to sagittate; segments not well defined in nearly entire pinna, or if well defined, all veins bifurcate; scales at bases of petioles ovate to ovate-lanceolate; lamina tissue glabrous on both sides .... 41. *A. shaferi*

69. Laminae pinnate-pinnatifid; pinnae pinnatifid; segments well defined in deeply dissected pinna; veins bifurcate on basal segments only; scales at bases of petioles lanceolate to linear-lanceolate; laminar tissue pubescent at least adaxially 70

70. Leaves creeping; costules and veins adaxially with long, stiff hairs, hairs 0.5-1.5 mm long; capitate, yellowish or

rather translucent glands present on laminar tissue adaxially .... 33. *A. physematioides*

70. Leaves erect or falcate, none creeping; costules and veins adaxially somewhat pubescent but lacking long, stiff hairs, hairs to 0.4 mm long; capitate glands absent on laminar tissue adaxially 71

71. Plants very small; largest pinnae no longer than 4 cm; rhizome scales ovate to ovate-bullate, not ciliate but glandular at margins; laminar texture herbaceous to papyraceous; pinnae strongly or rather inequilateral mainly at bases, basal acroscopic segments larger than the basal basiscopic ones............................ 31. *A. sancta*

71. Plants large; largest pinnae usually > 4 cm; rhizome scales lanceolate to linear-lanceolate, ciliate and eglandular at margins; laminar texture coriaceous; pinnae more or less equilateral on all sides; basal acroscopic segments equal or slightly larger than the basal basiscopic ones 72

72. Rachis hairs homogeneous in size, 0.1-0.4 mm long; laminae glabrescent abaxially, glabrous or sparsely strigulose adaxially .... 36b. *A. scalpturoides* var. *glabriuscula*

72. Rachis hairs not homogeneous in size, larger hairs to 1 mm long; laminae pubescent abaxially, densely strigose adaxially .... 36a. *A. scalpturoides* var. *scalpturoides*

50. Veins adaxially flat or sunken but definitively not prominent 73

73. Laminar tissue abaxially and/or indusia margins bearing sessile, reddish, globular glands 74

74. Segment margins dentate; sori marginal at the teeth of segments; indusia atropurpureous and glabrous .... 42. *A. limbata*

74. Segment margins entire, slightly crenate or crenate; sori medial or submarginal; indusia light brown and variously pubescent and/or glandular at margins 75

75. Rachises, costae and laminar tissue abaxially pubescent, or if glabrescent then the abaxial laminar tissue densely reddish globular-glandular; rachises stramineous 76

76. Pinnae mostly patent; segments +/– perpendicular to costae, linear-oblong, with apices rounded to acute, never truncate; pinnae abruptly reduced proximally, 4-8 pairs of reduced pinnae; veins to 18 pairs on largest segments; long whitish septate hairs on distal rachises present or absent 77

77. Plants mostly with unicellular hairs, if pluricellular hairs present, 0.3-0.4 mm long, only along the margins of the adaxial sulci of rachises and costae .... 45a. *A. balbisii* var. *balbisii*

77. Plants always with pluricellular hairs; pluricellular hairs 0.9-1.5 mm long, on distal rachises and costae abaxially .... 45b. *A. balbisii* var. *longipilosa*

76. Pinnae oblique; segments oblique to costae, deltate to oblong-falcate, with apices acute or truncate; pinnae gradually reduced proximally, 6-13 pairs of reduced pinnae;

veins to 9 pairs on largest segments; long whitish septate hairs on distal rachises absent 78

78. Segments strongly revolute, deltate, with round apices (when obvious); veins 2-6 pairs on largest segments; rachises abaxially densely pubescent, hairs mainly ciliform; basal segments elongate but not two times longer than the second pair of segments; reduced proximal pinnae 13-18 pairs .... 46. *A. opposita*

78. Segments somewhat revolute, oblong-falcate, with truncate apices; veins 7-10 pairs on largest segments; rachises abaxially glabrescent, pubescent on sulci margins, hairs recurved, not ciliform; basal segments elongate, usually two times longer than the second pair of segments; reduced proximal pinnae to 9 pairs .... 47. *A. resinifera*

75. Rachises, costae and laminar tissue abaxially glabrous; rachises mostly reddish, sometimes stramineous 79

79. Laminar apices long-acuminate or uncoiling; long filiform scales on costae and rachises abaxially absent; aerophores at abaxial pinna bases large, baculiform, covered by yellowish capitate glands; hairs on adaxial costae rigid, neither flexible nor recurved; rachises adaxially glabrous or pubescent, if pubescent, hairs rigid; petioles short, 2.1-8.5 cm long (mean 5.19 cm long); first three most basal pairs of reduced proximal pinnae deltate-pinnatifid, with deep sinuses; basal segments of reduced pinnae much larger than the rest and

also pinnatifid with deep sinuses; sori submarginal on veins
.... 49. *A. malangae*

79. Laminar apices short-acuminate; long filiform scales on costae and rachises abaxially present; aerophores at abaxial pinna bases somewhat encrusted and obscured by the rachises, neither elongate nor covered by yellowish capitate glands; hairs on adaxial costae flexible and recurved; rachises adaxially densely pubescent, hairs flexible and recurved; petioles long, 6.5-16.5 cm long (mean 11.12 cm long); first three most basal pairs of reduced proximal pinnae reduced to a segment or auricle, or if deltate-pinnatifid, with medium sinuses; sori medial on veins ...... 50. *A. pachyrachis*

73. Laminar tissue abaxially and/or indusia margins lacking sessile, globular glands, or else, bearing yellowish or rather translucent capitate glands 80

80. Indusia obvious, castaneous to bright red; proximal half of petioles atropurpureous to dark brown; rachises and costae abaxially lacking hairs; yellowish capitate glands, when present, few; costal scales abaxially absent; basal segments with margins deeply dentate ....
.... 43. *A. cooleyi*

80. Indusia obvious or very small, light brown, never reddish; proximal half of petioles mostly stramineous; rachises and costae abaxially variously pubescent; yellowish capitate glands densely distributed on aerophores, costae, and costules abaxially, and on both sides of laminar tissue; costal scales abaxially present; basal segments with margins entire or slightly crenate 81

81. Rhizome apices and croziers densely mucilaginous; rachises and costae abaxially sparsely pubescent; rachis scales present, some fully appressed to rachises; costal scales numerous; aerophores at abaxial costular bases of basal acroscopic segments present .... 21. *A. cheilanthoides*

81. Rhizome apices and croziers not mucilaginous; rachises and costae abaxially densely pubescent; rachis scales absent; costal scales few, one or two associated with pinna bases; aerophores at abaxial costular bases of basal acroscopic segment absent .... 22. *A. decrescens*

TAXONOMIC TREATMENT OF THE CARIBBEAN SPECIES OF *AMAUROPELTA*

The following is an account of the 50 species and 7 varieties that occur in the Caribbean Islands, of which three species and two varieties are newly described. These taxa are circumscribed within the nine sections defined by Smith (1974) with the exception of sect. *Amauropelta* which has been emended by removal of those species with foliar veins prominently raised adaxially and free pinnules at the bases of medial pinnae to the newly erected sect. *Scalpturata.*

I. Section **Phacelothrix**

Amauropelta sect. ***Phacelothrix*** (A.R. Sm.) O. Alvarez, **comb. nov.** *Thelypteris* subg. *Amauropelta* sect. *Phacelothrix* A.R. Sm., Amer. Fern J. 64: 88. 1974.—

Type: *Polypodium thomsonii* Jenman [≡ *Amauropelta thomsonii* (Jenman) Pic. Serm.]

Rhizomes erect, usually massive, trunk-like. *Petiole* bases, and sometimes entire croziers, coated with mucilage. *Laminae* abruptly reduced proximally, with many pairs of small and glanduliform reduced pinnae; *hairs* on rachises and costae fasciculate. *Aerophores* at pinna bases always present, to 5 mm in some species, and also present at costular bases. *Sori* submarginal; *indusia* reniform, persistent, and often capitate-glandular.

Around five species (Smith 1974); one in the Caribbean.

1. ***Amauropelta thomsonii*** (Jenman) Pic. Serm., Webbia 31: 251. 1977. *Polypodium thomsonii* Jenman, J. Bot. 24: 272. 1886. *Dryopteris thomsonii* (Jenman) C.Chr., Index Filic. 298. 1905; *non* (Hook. f.) Kuntze 1891. *Thelypteris thomsonii* (Jenman) Proctor, Bull. Inst. Jamaica, Sci. Ser. 5: 65. 1953.—Type. JAMAICA, **St. Andrew**: From New Haven Gap, *Jenman 254* (lectotype chosen by Proctor, 1985: 302: IJ!; isolectotypes: NY!, US!).

DISTRIBUTION.—Continental tropical America from southern Mexico to Panama, Colombia to Peru, and the Caribbean (Greater Antilles: Cuba, Hispaniola, and Jamaica).

II. Section **Lepidoneuron**

Amauropelta sect. ***Lepidoneuron*** (A.R. Sm.) O. Alvarez, **comb. nov.** *Thelypteris* subg. *Amauropelta* sect. *Lepidoneuron* A.R. Sm., Amer. Fern J. 64: 93. 1974.—Type: *Polypodium rude* Kunze [≡ *Amauropelta rudis* (Kunze) Pic. Serm.]

Rhizomes erect, usually massive, trunk-like. *Laminae* abruptly reduced proximally, with many pairs of small and glanduliform reduced pinnae; *laminar tissue* mostly with straight acicular hairs, some uncinate or glabrous, eglandular; *hairs* on rachises and costae not fasciculate, always acicular, and more or less evenly distributed; *costal scales* abaxially nearly always present. *Aerophores* at pinna bases present or absent, always absent at costular bases. *Sori* submarginal; *indusia* absent, deciduous or very small.

Perhaps 50 species (Smith 1974); three in the Caribbean.

2. *Amauropelta pteroidea* (Klotzsch) O. Alvarez, this dissertation, Chapter 3: 42. 2010. *Polypodium pteroideum* Klotzsch, Linnaea 20: 389. 1847. *Phegopteris pteroidea* (Klotzsch) Mett., Abh. Senckenberg. Naturf. Ges. 2: 293. 1858. *Nephrodium pteroideum* (Klotzsch) Diels, Nat. Pflanzenfam. [Engler & Prantl] 1, Abt. 4: 171. 1899. *Dryopteris pteroidea* (Klotzsch) C.Chr., Index Filic. 287. 1905. *Thelypteris pteroidea* (Klotzsch) R.M. Tryon, Rhodora 69: 8. 1967.—Type. COLOMBIA: "Galipan Columbiae", *Karsten 40* (lectotype chosen by Sánchez & al. 2006: 44: B [digital photo!]).

Dryopteris pteroidea var. *subsagittata* C.Chr., Kongel. Danske Vidensk. Selsk. Skr., Naturvidensk. Math. Afd., ser. 8, 6: 23. 1920.—Type. DOMINICAN REPUBLIC: Sto. Domingo, "prope Barahona", *Fuertes 1537* (holotype: B)

DISTRIBUTION.—Continental tropical America from Colombia to Peru, Venezuela, and the Caribbean (Greater Antilles: Cuba and Hispaniola).

3. ***Amauropelta muscicola*** (Proctor) O. Alvarez, this dissertation, Chapter 3: 40. 2010.

Thelypteris muscicola Proctor, Rhodora 63: 33. 1961.—Type. NEVIS: Upper W slope of Nevis Peak, *Proctor 19354* (holotype: A!; isotypes: IJ!, U [digital photo!]).

DISTRIBUTION.—Endemic to the Caribbean (Lesser Antilles: Nevis).

4a. ***Amauropelta rudis*** (Kunze) Pic. Serm. var. ***rudis***, Webbia 31: 251. 1977.

Polypodium rude Kunze, Linnaea 13: 133. 1839. *Phegopteris rudis* (Kunze) Mett., Fil. Hort. Bot. Lips. 83. 1856. *Glaphyropteris rudis* (Kunze) C. Presl ex Fée, Crypt. Vasc. Bresil 2: 41. 1873. *Nephrodium rude* (Kunze) Diels, Nat. Pflanzenfam. [Engler & Prantl] 1, Abt. 4: 171. 1899. *Dryopteris rudis* (Kunze) C.Chr., Index Filic. 289. 1905. *Lastrea rudis* (Kunze) Copel., Gen. Fil. (Ann. Cryptog. Phytopathol. 5) 140. 1947. *Thelypteris rudis* (Kunze) Proctor, Bull. Inst. Jamaica, Sci. Ser. 5: 64. 1953.—Type. VENEZUELA,

Distrito Capital: Chacao, Caracas, *Otto 612* (neotype chosen by Proctor, 1985: 317: B [digital photo!]).

Phegopteris ctenoides Fée, Mém. Foug., 11. Hist. Foug. Antil. 54, *t. 14, f. 2.* 1866. *Polypodium ctenoides* (Fée) Jenman, Bull. Bot. Dept. Jamaica, n.s. 4: 128. 1897. *Dryopteris ctenoides* (Fée) C.Chr., Index Filic. 260. 1905.—Type. HISPANIOLA: Antilles (Sto. Domingo), *de Tussac s.n.* (holotype: P [digital photo!]).

Dryopteris abbottiana Maxon, J. Wash. Acad. Sci. 14: 89. 1924. *Thelypteris abbottiana* (Maxon) Ching, Bull. Fan Mem. Inst. Biol. Bot. 10. 250. 1941.–
–Type. HAITI, **Ouest**: Morne de Ouésanne, near Furcy, *Leonard 4709* (holotype: US!).

Thelypteris rudis f. *cristata* Proctor, Amer. Fern J. 71: 61. 1981.—Type. JAMAICA: Unknown locality, *J.P. 1232-a.* (holotype: K; isotype: IJ!).

DISTRIBUTION.—Continental tropical America from Mexico to Guyana, Ecuador to Bolivia, and the Caribbean (Greater Antilles: Cuba, Hispaniola, Jamaica, and Puerto Rico).

4b. ***Amauropelta rudis*** var. ***gradata*** (C.Chr.) O. Alvarez, this dissertation, Chapter 3: 43. 2010. *Dryopteris rudis* var. *gradata* C.Chr., Kongl. Svenska Vetensk. Acad. Handl., ser. 3, 16: 25. 1937.—Type. HAITI, **Sud-Est**: Massif La Selle, Mourne Malanga, *Ekman H5888* (holotype: S; isotypes: IJ!, US!).

DISTRIBUTION.—Endemic to the Caribbean (Greater Antilles: Hispaniola).

III. Section **Uncinella**

Amauropelta sect. ***Uncinella*** (A.R. Sm.) J.P. Roux, Conspect. South. Afr. Pteridophyta 116. 2001. *Thelypteris* subg. *Amauropelta* sect. *Uncinella* A.R. Sm., Amer. Fern J. 64: 89. 1974.—Type: *Polypodium oligocarpum* Humb. & Bonpl. ex Willd. [≡ *Amauropelta oligocarpa* (Humb. & Bonpl. ex Willd.) Pic. Serm.]

Rhizomes erect or creeping. *Laminae* gradually to abruptly reduced proximally, mostly eglandular; *hairs* on rachises and costae not fasciculate, uncinate hairs always present at least in the abaxial side of petioles, rachises or costae, more or less evenly distributed; *laminar tissue* adaxially strigulose; *costal scales* abaxially mostly absent; *proliferous bulbils* at bases of some distal pinnae present or absent. *Aerophores* at pinna bases present or absent, always absent at costular bases. *Sori* mostly submarginal; *indusia* absent, or present and very small, sometimes deciduous.

Perhaps 50 species (Smith 1974); fourteen species occurring in the Caribbean.

5. *Amauropelta rupestris* (Klotzsch) O. Alvarez, this dissertation, Chapter 3: 44. 2010. *Leptogramma rupestris* Klotzsch, Linnaea 20: 415. 1847. *Gymnogramma rupestris* (Klotzsch) Kunze, Linnaea 23: 256. 1850. *Phegopteris rupestris* (Klotzsch) Mett., Fil. Hort. Bot. Lips. 82. 1856. *Dryopteris rupestris* (Klotzsch) C.Chr., Index Filic. 290. 1905. *Thelypteris rupestris* (Klotzsch)

C.F. Reed, Phytologia 17: 310. 1968.—Type. VENEZUELA, **Aragua**: "Colonia Tovar Columbiae", *Moritz 241* (holotype: P [digital photo!]; isotypes: C, HBG [photos deposited at GH!, MICH!], P [digital photo!]).

Gymnogramma diplazioides Desv., Mém. Soc. Linn. Paris 6: 214. 1827. *Phegopteris diplazioides* (Desv.) Mett., Ann. Sci. Nat., Bot., sér. 5, 2: 241. 1864. *Leptogramma diplazioides* (Desv.) Underw., Bull. Torrey Bot. Club 29: 626. 1902. *Dryopteris diplazioides* (Desv.) Urb., Symb. Antill. (Urban). 4: 21. 1903; *non* (Moritz ex Mett.) Kuntze 1891. *Nephrodium diplazioides* (Desv.) Hieron., Bot. Jahrb. Syst. 34: 445. 1904; *non* (Moritz ex Mett.) Hook. 1862. *Thelypteris diplazioides* (Desv.) Proctor, Bull. Inst. Jamaica, Sci. Ser. 5: 59. 1953; *non* (Moritz ex Mett.) Ching 1941. *Amauropelta diplazioides* (Desv.) Pic. Serm., Webbia 31: 251. 1977.—Type. HAITI: "Habitat in Hispaniola", *Anon.* (holotype: P [photo deposited at GH!]).

Aspidium diplazioides Moritz ex Mett., Abh. Senckenberg. Naturf. Ges. 2 : 367. 1858. *Nephrodium diplazioides* (Moritz ex Mett.) Hook., Sp. Fil. 4: 99. 1862; *non* (Desv.) Hieron. 1904. *Dryopteris diplazioides* (Moritz ex Mett.) Kuntze, Revis. Gen. Pl. 2: 812. 1891; *non* (Desv.) Urb. 1903. *Dryopteris moritziana* Urb., Symb. Antill. (Urban). 4: 21. 1903. *nom. illeg. Thelypteris diplazioides* (Moritz ex Mett.) Ching, Bull. Fan Mem. Inst. Biol. Bot. 10: 251. 1941; *non* (Desv.) Proctor 1953.—Type. VENEZUELA, **Aragua**: Tovar, *Moritz 408* (holotype: P [digital photo!]; isotypes: B [digital photo!], HBG [photos deposited at GH!, US!], P [digital photo!], US [fragment!]).

DISTRIBUTION.—Panama, Colombia, Venezuela, and the Caribbean (Greater Antilles: Hispaniola and Jamaica).

6. *Amauropelta linkiana* (C. Presl) O. Alvarez, this dissertation, Chapter 3: 39. 2010.

Grammitis linkiana C. Presl, Tent. Pterid. 209. 1836. *Gymnogramma polypodioides* Link, Hort. Berol. [Link] 2: 50. 1833 (*non* Spreng. 1827) *nom. illeg. Leptogramma linkiana* (C. Presl) J. Sm., J. Bot. (Hooker) 4: 52. 1841. *Gymnogramma linkiana* (C. Presl) Kunze, Linnaea 18: 310. 1844. *Phegopteris linkiana* (C. Presl) Mett., Fil. Hort. Bot. Lips. 82. 1856. *Nephrodium linkianum* (C. Presl) Diels, Nat. Pflanzenfam. [Engler & Prantl] 1, Abt. 4: 172. 1899. *Dryopteris linkiana* (C. Presl) Maxon, J. Wash. Acad. Sci. 14: 199. 1924. *Lastrea linkiana* (C. Presl) Copel., Gen. Fil. (Ann. Cryptog. Phytopathol. 5) 139. 1947. *Thelypteris linkiana* (C. Presl) R.M. Tryon, Rhodora 69: 6. 1967.—Type. Cultivated specimen, "H[ortus] B[erolinensis]", ex herb., *Link s.n.* (holotype: B [digital photo!]).

Phegopteris duchassaingiana Fée, Mém. Foug., 11. Hist. Foug. Antil. 57, t. 14, f. 3. 1866.—Type. GUADELOUPE: *L'Herminier s.n.* (holotype: P [digital photo! and photo deposited at US!]; isotype: P [digital photo!]).

DISTRIBUTION.—Continental tropical America from Mexico to Brazil, Ecuador, Peru, Bolivia, and the Caribbean (Greater Antilles: Cuba, Hispaniola and (probably) Jamaica; Lesser Antilles: Guadeloupe and Martinique).

7. *Amauropelta consimilis* (Fée ex Baker) O. Alvarez, this dissertation, Chapter 3: 35. 2010. *Gymnogramma gracilis* var. *consimilis* Fée ex Baker, Syn. Fil. (Hooker & Baker) 377. 1868. *Gymnogramma consimilis* (Fée ex Baker) Jenman, Bull. Bot. Dept. Jamaica, n.s. 4: 203. 1897. *Dryopteris consimilis* (Fée ex Baker) C.Chr., Kongel. Danske Vidensk. Selsk. Skr., Naturvidensk. Math. Afd., ser. 7, 4: 314. *f. 37.* 1907. *Thelypteris consimilis* (Fée ex Baker) Proctor, Rhodora 68: 468. 1966.—Type. GUADELOUPE: *L'Herminier 73* (holotype: L [photo deposited at MICH!]).

Dryopteris mollicella Maxon, Proc. Biol. Soc. Wash. 36: 49. 1923. *Thelypteris mollicella* (Maxon) Ching, Bull. Fan Mem. Inst. Biol. Bot. 10: 252. 1941.—Type. DOMINICA: Dominica, *Bailey 771* (holotype: US!; isotype: P [digital photo!]).

DISTRIBUTION.—Endemic to the Caribbean (Lesser Antilles: Guadeloupe, Dominica, Martinique, and St. Vincent).

8. *Amauropelta gracilis* (Heward) O. Alvarez, this dissertation, Chapter 3: 38. 2010. *Gymnogramma gracilis* Heward, Mag. Nat. Hist., ser. 2, 2: 457. 1838. *Leptogramma gracilis* (Heward) J. Sm., J. Bot. (Hooker) 4: 52. 1841. *Grammitis hewardii* T. Moore, Gard. Chron. 261. 1856. (based on *Gymnogramma gracilis* Heward). *nom. illeg. Polypodium hewardii* (T. Moore) Griseb., Fl. Brit. W.I. [Grisebach]. 696. 1864. *Dryopteris gracilis* (Heward) Domin, Rozpr. Kral. Ceske Spolecn. Nauk, Tr. Mat.-Prir., N.s. 2:

210. 1929. *Thelypteris gracilis* (Heward) Proctor, Bull. Inst. Jamaica, Sci. Ser. 5: 60. 1953.—Type. JAMAICA. **Manchester**: From Old England, 1824, *Heward s.n.* (holotype: K).

DISTRIBUTION.—Endemic to the Caribbean (Greater Antilles: Cuba and Jamaica).

9. ***Amauropelta heteroclita*** (Desvaux) Pic. Serm., Webbia 31: 251. 1977. *Polypodium heteroclitum* Desvaux, Mag. Neuesten Entdeck. Gesammten Naturk. Ges. Naturf. Freunde Berlin 5: 318. 1811. *Phegopteris heteroclita* (Desvaux) Kuhn ex Krug, Bot. Jahrb. Syst. 24: 133. 1897. *Dryopteris heteroclita* (Desvaux) C.Chr., Index Filic. 270. 1905. *Thelypteris heteroclita* (Desvaux) Ching, Bull. Fan Mem. Inst. Biol. Bot. 10: 252. 1941. *Lastrea heteroclita* (Desvaux) Copel., Gen. Fil. (Ann. Cryptog. Phytopathol. 5) 139. 1947.—Type. JAMAICA: Unknown locality, probably collected by *de Tussac* (lectotype chosen by Proctor 1985: 306: P).

Polypodium involutum Desvaux, Mag. Neuesten Entdeck. Gesammten Naturk. Ges. Naturf. Freunde Berlin 5: 318. 1811; *non* Baker 1889.—Type. WEST INDIES: "Habitat in Antillis", from the West Indies without exact locality, probably collected by *de Tussac* (lectotype chosen by Proctor 1985: 306: P).

DISTRIBUTION.—Endemic to the Caribbean (Greater Antilles: Cuba, Hispaniola, and Jamaica).

10a. ***Amauropelta oligocarpa*** (Humb. & Bonpl. ex Willd.) Pic. Serm. var. ***oligocarpa***, Webbia 31: 251. 1977. *Polypodium oligocarpum* Humb. & Bonpl. ex Willd., Sp. Pl., ed. 4 [Willdenow] 5: 201. 1810. *Aspidium oligocarpum* (Humb. & Bonpl. ex Willd.) Kunth, Nov. Gen. Sp. [H.B.K.] 1: 13.1815. *Nephrodium oligocarpum* (Humb. & Bonpl. ex Willd.) Desvaux, Mém. Soc. Linn. Paris 6: 256. 1827. *Aspidium oligocarpum* (Humb. & Bonpl. ex Willd.) Mett., Abh. Senckenberg. Naturf. Ges. 77. 1858 (*non* (Humb. & Bonpl. ex Willd.) Kunth 1816) *nom. illeg. Lastrea oligocarpa* (Humb. & Bonpl. ex Willd.) T. Moore, Index Fil. (T. Moore) 86. 1858. *Dryopteris oligocarpa* (Humb. & Bonpl. ex Willd.) Kuntze, Revis. Gen. Pl. 3: 378. 1898. *Dryopteris oligophlebia* (Humb. & Bonpl. ex Willd.) C.Chr., Index Filic. 280. 1905. *Thelypteris oligocarpa* (Humb. & Bonpl. ex Willd.) Ching, Bull. Fan Mem. Inst. Biol. Bot. 10: 253. 1941.—Type. VENEZUELA, **Sucre**: Cumaná, *Humboldt 441* (holotype: ?; isotype: B [digital photo!]).

DISTRIBUTION.—Continental tropical America, from Mexico to Brazil, Ecuador to Argentina, and the Caribbean (Greater Antilles: Cuba, Hispaniola and Jamaica).

10b. ***Amauropelta oligocarpa*** var. ***navarrensis*** (H.Christ) O. Alvarez, this dissertation, Chapter 3: 41. 2010. *Aspidium navarrense* H.Christ, Bull. Herb. Boissier, sér. 2, 6: 160. 1906. *Dryopteris navarrensis* (H.Christ) H.Christ, Bull. Herb. Boissier, sér. 2, 7: 262. 1907. *Dryopteris oligocarpa* var. *navarrensis* (H.Christ) C.Chr., Index Filic., Suppl. 1906-1912. 36. 1913. *Thelypteris* *navarrensis* (H.Christ) Proctor, Bull. Inst. Jamaica, Sci. Ser. 5: 61. 1953. *Amauropelta navarrensis* (H.Christ) Pic. Serm., Webbia 31: 251. 1977.—Type. COSTA RICA, **Cartago**: Navarro, *Werckle s.n.* (holotype: P [digital photo!]; isotype: US!).

Dryopteris lomatosora Copel., Univ. Calif. Publ. Bot. 19: 298, *t. 54.* 1941. *Lastrea lomatosora* (Copel.) Copel., Gen. Fil. (Ann. Cryptog. Phytopathol. 5) 139. 1947. *Thelypteris lomatosora* (Copel.) C.F. Reed, Phytologia 17: 289. 1968.—Type. PERU, **Huanuco**: District Churubamba: Hacienda Mercedes, Poca Perga, *Mexia 8187* (holotype: UC; isotypes: GH!, MO, F).

DISTRIBUTION.—Continental tropical America from Costa Rica to Venezuela, Ecuador, Peru, and the Caribbean (Greater Antilles: Cuba, Hispaniola, Jamaica, and Puerto Rico).

11. ***Amauropelta intromissa*** (C.Chr.) O. Alvarez, this dissertation, Chapter 3: 39. 2010. *Dryopteris intromissa* C.Chr., Kongl. Svenska Vetensk. Acad. Handl., ser. 3, 16: 22. *t. 4, f. 9-10.* 1937.—Type. HAITI, **Sud-Est**: Morne La Selle, Marigot, Jardins Bois-Pin, *Ekman H 10060* (holotype: S; isotypes: IJ!, US!).

DISTRIBUTION.—Endemic to the Caribbean (Greater Antilles: Hispaniola).

12. ***Amauropelta negligens*** (Jenman) O. Alvarez, this dissertation, Chapter 3: 40. 2010. *Nephrodium negligens* Jenman, Bull. Bot. Dept. Jamaica, n.s. 3: 21. 1896.

Dryopteris negligens (Jenman) C.Chr., Index Filic. 279. 1905. *Thelypteris negligens* (Jenman) Proctor, Amer. Fern. J. 71: 58. 1981.—Type. JAMAICA: From Jamaica without exact locality, 1891, *Jenman s.n.* (holotype: NY!).

DISTRIBUTION.—Endemic to the Caribbean (Greater Antilles: Jamaica).

13. *Amauropelta germaniana* (Fée) O. Alvarez, this dissertation, Chapter 3: 37. 2010.

Phegopteris germaniana Fée, Mém. Foug., 11. Hist. Foug. Antil. 55, *t. 13, f. 2*. 1866. *Polypodium germanianum* (Fée) Baker, Syn. Fil. (Hooker & Baker) 306. 1867. *Dryopteris germaniana* (Fée) C.Chr., Index Filic. 267. 1905. *Lastrea germaniana* (Fée) Copel., Gen. Fil. (Ann. Cryptog. Phytopathol. 5) 139. 1947. *Thelypteris germaniana* (Fée) Proctor, Rhodora 61: 306. 1960.—Type. GUADELOUPE: 1861, *L'Herminier s.n.* (holotype: P [digital photo!]; isotypes: BM, P [digital photo!]).

Nephrodium nimbatum Jenman, Gard. Chron., ser. 3, 15: 264. 1894 [or] Bull. Bot. Dept. Jamaica, n.s. 3: 67. 1896. *Dryopteris nimbata* (Jenman) C.Chr., Index Filic. 279. 1905. *Dryopteris rustica* var. *nimbata* (Jenman) C.Chr., Kongel. Danske Vidensk. Selsk. Skr., Naturvidensk. Math. Afd., ser. 7, 10: 141. 1913.—Type. JAMAICA, **St. Thomas**: From Moody's Gap, *Jenman 2* (lectotype chosen by Christensen 1913: 141: K).

DISTRIBUTION.—Continental tropical America from Costa Rica to Venezuela, and the Caribbean (Greater Antilles: Cuba, Hispaniola, Jamaica, and Puerto Rico; Lesser Antilles: Montserrat, Guadeloupe, Dominica, Martinique, and St. Vincent).

14. ***Amauropelta inabonensis*** (Proctor) O. Alvarez, this dissertation, Chapter 3: 39. 2010. *Thelypteris inabonensis* Proctor, Amer. Fern J. 75: 61. 1985.—Type. PUERTO RICO, **Ponce**: Cordillera Central, Toro Negro State Forest, along headwaters of Río Inabón above high falls, *Proctor 40069* (holotype: US!; isotypes: IJ!, SJ).

DISTRIBUTION.—Endemic to the Caribbean (Greater Antilles: Puerto Rico).

15. ***Amauropelta rustica*** (Fée) O. Alvarez, this dissertation, Chapter 3: 44. 2010. *Phegopteris rustica* Fée, Mém. Foug., 11. Hist. Foug. Antil. 55, *t. 13, f. 1.* 1866. *Polypodium rusticum* (Fée) Baker, Syn. Fil. (Hooker & Baker) 306. 1867. *Dryopteris rustica* (Fée) C.Chr., Index Filic. 290. 1905. *Thelypteris rustica* (Fée) Proctor, Rhodora 61: 306. 1959[1960].—Type. GUADELOUPE: From Ravine la Rose de Matèliane, 1861, *L'Herminier s.n.* (holotype: ?, not found at P).

Dryopteris dominicensis C.Chr., Smithsonian Misc. Collect. 52: 384. 1909.—Type. DOMINICA: From Mount Diablotin, *Lloyd 987* (holotype: US!).

DISTRIBUTION.—Endemic to the Caribbean (Lesser Antilles: Guadeloupe, Dominica, Martinique, and St. Vincent).

16. *Amauropelta hydrophila* (Fée) O. Alvarez, this dissertation, Chapter 3: 38. 2010.

Phegopteris hydrophila Fée, Mém. Foug., 11. Hist. Foug. Antil. 56, *t. 13, f. 3*. 1866. *Polypodium hydrophilum* (Fée) Baker, Ann. Bot. (Oxford) 5: 456. 1891. *Dryopteris hydrophila* (Fée) C.Chr., Index Filic. 271. 1905. *Thelypteris hydrophila* (Fée) Proctor, Rhodora 61: 306. 1959 [1960].—Type. GUADELOUPE: 1861, *L'Herminier s.n.* (holotype: ?, not found at P [photos from P deposited at GH!, NY!, US!]; isotypes: BM [photo deposited at MICH!], IJ!).

DISTRIBUTION.—Endemic to the Caribbean (Lesser Antilles: Guadeloupe and Martinique).

17. *Amauropelta antillana* (Proctor) O. Alvarez, this dissertation, Chapter 3: 33. 2010.

Thelypteris antillana Proctor, Rhodora 63: 33. 1961.—Type. ST. KITTS: Upper SW spur of Verchild's Mountain below Dodans Pond, *Proctor 19587* (holotype: A!; isotype: IJ!).

DISTRIBUTION.—Endemic to the Caribbean (Lesser Antilles: St. Kitts, Guadeloupe, and Dominica).

18. *Amauropelta scalaris* (H.Christ) Á.Löve & D.Löve, Taxon 26: 325. 1977. *Aspidium scalare* H.Christ, Bull. Herb. Boissier, sér 2, 6: 159. 1906. *Dryopteris scalaris* (H.Christ) C.Chr., Kongel. Danske Vidensk. Selsk. Skr., Naturvidensk. Math. Afd., ser. 7, 4: 323, *f. 47*. 1907. *Lastrea scalaris* (H.Christ) Copel., Gen. Fil. (Ann. Cryptog. Phytopathol. 5) 140. 1947. *Thelypteris scalaris* (H.Christ) Alston, J. Wash. Acad. Sci. 48: 234. 1958.— Type. GUATEMALA, **Alta Verapaz**: Cubilquitz, *Tuerckheim 8357* (lectotype chosen by Christensen 1907: 324: P [digital photo!]; isolectotypes: B [digital photo!], GH, P [digital photo!], US!).

DISTRIBUTION.—Continental tropical America from southern Mexico to Venezuela, Ecuador, Peru, and the Caribbean (Greater Antilles: Cuba).

IV. Section **Apelta**

Amauropelta sect. ***Apelta*** (A.R. Sm.) O. Alvarez, **comb. nov.** *Thelypteris* subg. *Amauropelta* sect. *Apelta* A.R. Sm., Amer. Fern J. 64: 94. 1974.— Type: *Nephrodium deflexum* C. Presl [≡ *Amauropelta deflexa* (C. Presl.) Á.Löve & D.Löve].

Rhizomes erect. *Laminae* gradually reduced proximally, with few pairs of reduced proximal pinnae; *laminar tissue* sparsely pubescent to glabrous, eglandular; *hairs* on rachises, costae, and laminar tissue, when present, not fasciculate, always acicular; *costal* *scales* abaxially absent. *Aerophores* at pinna bases absent. *Sori* submarginal; *indusia* absent, deciduous or very small, *sporangia* glabrous.

Around five species (Smith 1974), one in the Caribbean.

19. *Amauropelta sellensis* (C.Chr.) O. Alvarez, this dissertation, Chapter 3: 45. 2010.

Dryopteris sellensis C.Chr., Kongl. Svenska Vetensk. Acad. Handl., ser. 3, 16: 24, *t. 3, f. 7-8*. 1937.—Type. HAITI, **Sud-Est**: Massif de la Selle, high plateau of La Selle on the road Camp Franc-Saltron, *Ekman H3087* (holotype: S; isotypes: IJ!, US!).

DISTRIBUTION.—Endemic to the Caribbean (Greater Antilles: Hispaniola).

V. Section **Blepharitheca**

Amauropelta sect. ***Blepharitheca*** (A.R. Sm.) O. Alvarez, **comb. nov.** *Thelypteris* subg. *Amauropelta* sect. *Blepharitheca* A.R. Sm., Amer. Fern J. 64: 94. 1974.—Type: *Polypodium concinnum* Willd. [≡ *Amauropelta concinna* (Willd.) Pic. Serm.].

Rhizomes erect. *Laminae* gradually reduced proximally, with few pairs of reduced proximal pinnae; *laminar tissue* abaxially densely pubescent, eglandular; *rachises* and *costae* densely minutely pubescent, hairs 0.1 mm long or less; *hairs* on rachises, costae, and laminar tissue not fasciculate, always acicular; *costal scales* abaxially absent.

Aerophores at pinna bases absent. *Sori* submarginal; *indusia* absent, deciduous or very small, *sporangia* setulose or glabrous.

Around five species (Smith 1974), one species occurs in the Caribbean.

20. *Amauropelta concinna* (Willd.) Pic. Serm., Webbia 31: 251. 1977. *Polypodium concinnum* Willd., Sp. Pl., ed. 4 [Willdenow] 5: 201. 1810. *Phegopteris concinna* (Willd.) Fée, Mém. Foug., 5. Gen. Filic. 243. 1852. *Aspidium concinnum* (Willd.) Mett., Fil. Hort. Bot. Lips. 89. 1856. *Lastrea concinna* (Willd.) T. Moore, Index Fil. (T. Moore) 86. 1858. *Nephrodium concinnum* (Willd.) Baker, Syn. Fil. (Hooker & Baker) 268. 1867. *Dryopteris concinna* (Willd.) Kuntze, Revis. Gen. Pl. 2: 812. 1891. *Aspidium conterminum* Willd. var. *concinnum* (Willd.) Krug, Bot. Jahrb. Syst. 24: 115. 1897. *Thelypteris concinna* (Willd.) Ching, Bull. Fan Mem. Inst. Biol. Bot. 10: 251. 1941.—Type. VENEZUELA, **Distrito Capital**: From Caracas, *Bredemeyer s.n., Herb. Willd.* (holotype: B [digital photo!]).

DISTRIBUTION.—Continental tropical America from Mexico to Venezuela, Ecuador to southern Argentina, and the Caribbean (Greater Antilles: Cuba, Hispaniola, and Jamaica).

VI. Section **Blennocaulon**

Amauropelta sect. ***Blennocaulon*** (A.R. Sm.) O. Alvarez, **comb. nov.** *Thelypteris* subg. *Amauropelta* sect. *Blennocaulon* A.R. Sm., Amer. Fern J. 64: 92. 1974.—

Type: *Aspidium cheilanthoides* Kunze [≡ *Amauropelta cheilanthoides* (Kunze) Á.Löve & D.Löve].

Rhizomes erect, usually massive, trunk-like. *Petiole* bases, and sometimes entire croziers, coated with mucilage. *Laminae* abruptly to gradually reduced proximally, with few to many pairs of reduced proximal pinnae, most basal ones auriculiform; *laminar tissue* pubescent to glabrescent abaxially, with numerous sessile globular glands; *rachises* and *costae* abaxially pubescent, sessile glandular; *hairs* on rachises, costae, and laminar tissue not fasciculate, acicular and usually long and septate; *costal scales* abaxially absent. *Aerophores* at pinna bases present, large and obvious, mostly absent at costular bases. *Sori* submarginal to marginal; *indusia* obscure, small, deciduous and marginal glandular; *sporangia* glabrous.

Perhaps ten species (Smith 1974), only one species in the Caribbean.

21. *Amauropelta cheilanthoides* (Kunze) Á.Löve & D.Löve, Taxon 26: 325. 1977.

Aspidium cheilanthoides Kunze, Linnaea 22: 578. 1849. *Aspidium molliculum* var. *cheilanthoides* (Kunze) E. Fourn., Mexic. Pl. 1: 94. 1872. *Lastrea cheilanthoides* (Kunze) T. Moore, Index Fil. (T. Moore) 88. 1858. *Dryopteris cheilanthoides* (Kunze) C.Chr., Index Filic. 257. 1905. *Thelypteris cheilanthoides* (Kunze) Proctor, Bull. Inst. Jamaica, Sci. Ser. 5: 58. 1953.—Type. BRAZIL, **Minas Gerais**: From Caldas, *Regnell 326* (holotype: LZ†; isotype: S ?).

Dryopteris deflectens C.Chr., Kongl. Svenska Vetensk. Acad. Handl., ser. 3, 16: 25, *t. 3, f. 9-11*. 1937.—Type. HAITI, **Sud-Est**: Massif de la Selle, Croix-des-Bouquets, Badeau, *Ekman H7729* (holotype: S; isotype: US!).

DISTRIBUTION.—Continental tropical America from Mexico to Venezuela, Ecuador to Bolivia, southern Brazil, and the Caribbean (Greater Antilles: Cuba, Hispaniola, and Jamaica).

VII. Section **Adenophyllum**

Amauropelta sect. ***Adenophyllum*** (A.R. Sm.) O. Alvarez, **comb. nov.** *Thelypteris* subg. *Amauropelta* sect. *Adenophyllum* A.R. Sm., Amer. Fern J. 64: 88. 1974.—Type: *Aspidium rivularioides* Fée. [≡ *Amauropelta rivularioides* (Fée) O. Alvarez].

Rhizomes creeping to suberect. *Laminae* gradually reduced proximally, with few pairs of reduced proximal pinnae; *laminar tissue* densely pubescent abaxially; *rachises* and *costae* abaxially variously pubescent; densely yellowish capitate glandular on costae and costules abaxially, and both sides of laminar tissue; *hairs* on rachises, costae, and laminar tissue not fasciculate, always acicular; *costal scales* abaxially present, few. *Aerophores* at pinna bases mostly absent. *Sori* submarginal; *indusia* obvious, large, capitate glandular; *sporangia* glabrous.

Around 25 species (Smith 1974); one in the Caribbean.

22. *Amauropelta decrescens* (Proctor) O. Alvarez, this dissertation, Chapter 3: 36. 2010.

Thelypteris decrescens Proctor, Amer. Fern J. 71: 57. 1981.—Type. JAMAICA, **St. Thomas**: From upper W slope of Blue Mountain Peak, *Underwood 1513* (holotype: NY!).

DISTRIBUTION.—Endemic to the Caribbean (Greater Antilles: Jamaica).

VIII. Section **Scalpturata**

Amauropelta sect. ***Scalpturata*** O. Alvarez, **sect. nov.**—Type: *Phegopteris scalpturoides* Fée [≡ *Amauropelta scalpturoides* (Fée) O. Alvarez].

Rhizoma repens vel erecta. Follis ascendens in fasciculos vel semotus crescens. Laminae coriacea, pinnatus vel pinnatus-pinnatifidus vel bipinnatus-pinnatifidus, cum liber pinnulae unus ad aliquot ubi bipinnatus, abrupte redacta inferiora cum dimidia pinnae aliquot per paucus (usque ad 28 paribus); lamina pagina inferiore pubens vel glabrata et globuloso-glandulosa vel eglandulosa superiore glabrata vel strigulosa; rachis costaeque varie pubens vel glabratus; pilis omnis acicularis nullus fasciculatus; costae infra paleis destitutus. Nervis valde promines minimum adaxialis, simplex vel bifurcatus vel trifurcatus. Sori submarginalis; indusii manifestus reniformis et persistens vel obscurus, parvulus et caducus, pubens vel marginalis glandulosus; sporangia glabratus vel setulosus.

Rhizomes long-creeping to erect. *Leaves* ascending in fascicles or growing distantly from one another. *Laminae* abruptly to gradually reduced proximally, with few to several pairs of reduced proximal pinnae; *laminae* pinnate to pinnate-pinnatifid to bipinnate-pinnatifid, thick and coriaceous, when bipinnate with 1- several pairs of free pinnules; *laminar tissue* densely pubescent to glabrescent abaxially, with few dispersed sessile globular glands, or eglandular, glabrescent to strigulose adaxially; *rachises* and *costae* variously pubescent to glabrescent; *hairs* on rachises, costae, and laminar tissue not fasciculate, all acicular; *costal scales* abaxially absent. *Veins* strongly prominent at least on adaxial side, several bifurcate to trifurcate. *Aerophores* at pinna bases mostly absent. *Sori* submarginal; *indusia* obvious, reniform, and persistent, to obscure, small, and deciduous, pubescent or marginal glandular; *sporangia* glabrous to setulose.

Section *Scalpturata* groups former members of sect. *Amauropelta* with prominently raised adaxial veins; the name of the section was chosen to emphasize this particular character. This new section has about 23 taxa (19 species and 4 varieties), most of them endemic to the Greater Antilles, except for *A. sancta*, which also occurs in the Lesser Antilles and continental tropical America. In 1974, Smith recommended subsectional status for a group that includes *A. firma*, however, the present study suggests that sectional recognition would be more appropriate when species like *A. scalpturoides*, *A. piedrensis*, and *A. sancta* are integrated within the new section. The molecular analysis (Figures 4 and 5, this dissertation, Chapter 2) shows the species of sect. *Scalpturata* placed in a monophyletic lineage (BP = 93%), within a polytomy including species from sections *Uncinella*, *Lepidoneuron*, and *Adenophyllum*. All species in sect. *Scalpturata* can be distinguished from other species in the genus by their prominent veins adaxially (Figure 7C, E). Furthermore, the spore perispore forms an incomplete reticulum, different from the lattice-like mesh exhibited by most amauropeltoid species (Figure 8G, H, and Figure 9). These characters, in conjuction with the preliminary phylogenetic data, support recognition of this group at the sectional level.

23. *Amauropelta aliena* (C.Chr.) O. Alvarez, this dissertation, Chapter 3: 33. 2010.

Dryopteris aliena C.Chr., Kongl. Svenska Vetensk. Acad. Handl., ser. 3, 16: 23, *t. 4, f. 1-3.* 1937.—Type. HAITI, **Nord**: Massif du Nord, Vallière, top of Morne Salvane, *Ekman H9935* (holotype: S; isotype: US!).

Thelypteris denudata C. Sánchez & Caluff, Willdenowia 35: 159, *f. 1.* 2005.—Type. CUBA, **Gramma**: B. Masó, Parque Nacional Turquino, Sierra Maestra, Pico Suecia, *Sánchez & Morejón HFC 81246* (holotype: HAJB; isotypes: B [digital photo!], BSC!, HAJB).

DISTRIBUTION.—Endemic to the Caribbean (Greater Antilles: Cuba and Hispaniola).

Figure 8. SEM images of spores of Caribbean *Amauropelta*. A. *A. balbisii* var. *balbisii* (*Shafer & Leon 13649*). B. *A. balbisii* var. *balbisii* (*Gonzales 585*). C. *A. limbata* (*Pére Duss 1579*). D. *A. cooleyi* (*Morton 5965*). E. *A. consanguinea* (*Pére Duss 4410*). F. *A. sancta* (*Shafer 7856*). G. *A. basisceletica* (*Ekman 5188*). H. *A. scalpturoides* var. *glabriuscula* (*Clement 7549*). Scale: bar = 10 µm.

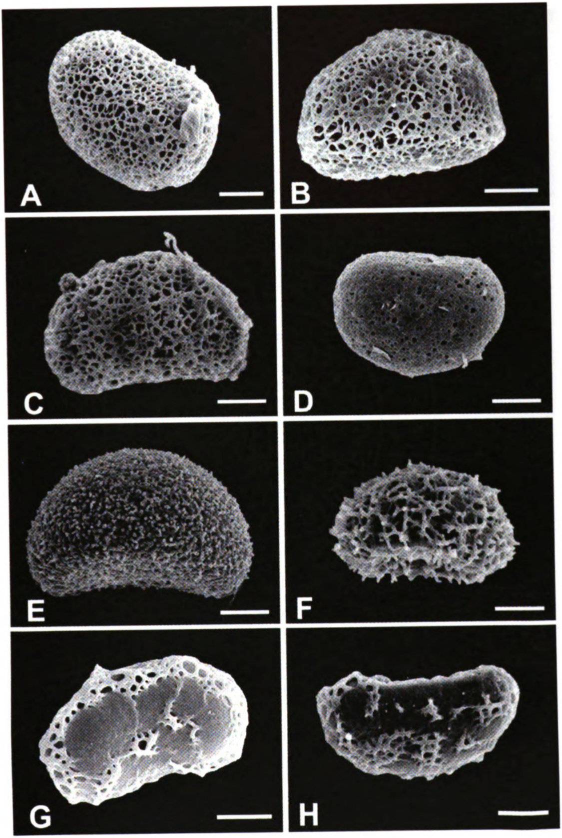
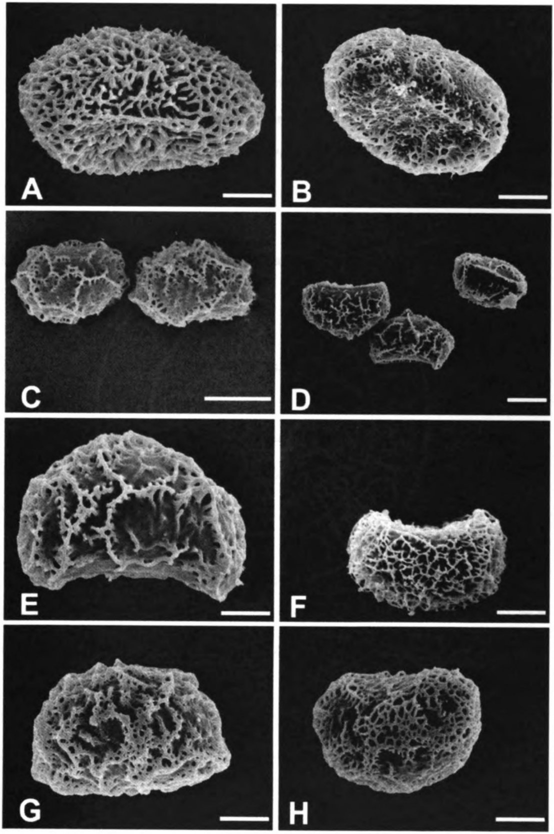

A
B
C
D
E
F
G
H

Figure 9. SEM images of spores of Caribbean *Amauropelta*. A. *A. rheophyta* (*Proctor & Padrón 45683*). B. *A. physematioides* (*Howard & Howard 9159*). C. *A. piedrensis* var. *quisqueyana* (*Zanoni et al. 32802*). D, E. *A. piedrensis* var. *piedrensis* (*Clement 7158*). F. *A. rupicola* (*Ekman H6308*). G. *A. gracilenta* (*Maxon & Killip 1355*). H. *A. nockiana* (*Maxon 9683*). Scale: A, B, E-H, bar = 10 μm; C, D, bar = 20 μm.


A
B
C
D
E
F
G
H

24. *Amauropelta firma* (Baker ex Jenman) O. Alvarez, this dissertation, Chapter 3: 36. 2010. *Nephrodium firmum* Baker ex Jenman, J. Bot. 17: 260. 1879. *Dryopteris firma* (Baker ex Jenman) C.Chr., Index Filic. 266. 1905. *Thelypteris firma* (Baker ex Jenman) Proctor, Bull. Inst. Jamaica, Sci. Ser. 5: 60. 1953.—Type. JAMAICA, **Portland**: From Blue Mountain Peak, *Jenman 36* (holotype: K).

DISTRIBUTION.—Endemic to the Caribbean (Greater Antilles: Jamaica and Hispaniola).

25. *Amauropelta manaiorum* O. Alvarez, **sp. nov.** Figure 10

Rhizoma erecta; follis ascendens in fasciculos, quasi glabratus praeter adaxial sulci secus axin; laminae longa quam petioli, 1-pinnatus; pinnae hastatus basin versus vadi dissecta; sporangia setulosus.

TYPE—DOMINICAN REPUBLIC, **La Vega**: Cordillera Central: 12 km de la carretera Duarte (Santo Domingo-Santiago) en la carretera a El Río y Constanza: "Casabito", en el valle del Río Jalubey. 19°03' N, 70°30' O, *Zanoni et al. 23023* (holotype: JBSD!).

DESCRIPTION: *Rhizomes* erect, 0.98-1.67 cm in diameter, bearing numerous scales on apices; *scales* 2.1-6.65 mm long, 0.7-1.05 mm wide, castaneous to light brown, lustrous, linear-lanceolate to lanceolate, long-acuminate at apices, densely pubescent, hairs short acicular, 0.04-0.1 mm long, patent, eglandular. *Leaves* monomorphic, with main axis adaxially sulcate, ascending in fascicles, 24.82-27.9 cm long. *Petioles* 7.88-9.2 cm long, 1.1-1.5 mm in diameter, dark brown proximally to olivaceous distally, more or less densely hispid at bases, glabrescent adaxially, hairs all acicular, 0.06-0.1 mm long, patent, eglandular, sparsely scaly, always denser proximally, scales similar to those of the rhizomes. *Rachises* olivaceous to stramineous, finely hispid on adaxial side, glabrous abaxially, hairs all acicular, 0.06-0.12 mm long, patent, eglandular, sparsely scaly abaxially, scales 0.2-0.4 mm long, 0.1-0.14 mm wide, castaneous, lustrous, deltate-acuminate, clathrate, sparsely pubescent and fully appressed to rachises. *Laminae* pinnate, thick and coriaceous, 17.28-20.02 cm long, 2.64-4.14 cm wide, linear-lanceolate, long-acuminate at apices, gradually reduced proximally, 2-3 pairs of reduced proximal pinnae, those oblong, hastate at bases with margins undulate and obtuse, short-acuminate apices; *laminar tissue* glabrous on both sides, except some marginal hairs, those acicular, 0.1-0.12 mm long, patent, eglandular. *Pinnae* sessile, 1.61-1.85 cm long, 0.28-0.61 cm wide, 30-40 pairs, alternate, lanceolate with margins undulate, hastate at bases, obtuse at apices, with shallow sinuses, proliferous bulbils absent; *aerophores* occasionally present, small, clavate, purplish or blackish in color; *costae* adaxially sulcate, glabrous on both sides, eglandular and lacking costal scales; *segments* only obvious at pinna bases, oblique, 0.16-0.18 cm wide, deltate to oblong, apices acute to obtuse, with margins undulate, basal segments obviously elongate, basal acroscopic larger than basiscopic ones; *costa-sinus distance* 1.35-1.75 mm; *costules* present on basal segments only, glabrous on both sides, eglandular, olivaceous to stramineous, prominent on both sides; *veins* prominent on both sides, 3-4 pairs on basal segments only, olivaceous to stramineous, mostly bifurcate reaching the margins of pinnae distal to the shallow sinuses, glabrous on both sides, eglandular. *Sori* round, submarginal to marginal; *indusia* obscure, deciduous or persistent as 2-3 hairs or small, ear-like, light brown, sparsely hairy, bearing acicular hairs to 0.1 mm long, glandular at margins, glands sessile, globular and reddish, or eglandular; *sporangia* glabrous or setulose, each with up to 5 setae.

DISTRIBUTION.—Endemic to the Caribbean (Greater Antilles: Hispaniola).

SELECTED SPECIMENS EXAMINED (Appendix B).

Amauropelta manaiorum occurs at high-altitude, (900-)1,000-2,000 m, in cloud forest in the Cordillera Central of Dominican Republic. The species is dedicated to the Mexican band "Maná", which I had the opportunity to see live in concert during my last field work in Dominican Republic. Although I've been an eager follower and fan of the band since 1992, it is not only their music that inspired me to dedicate to them this new species but their active participation in the fight for the environment; proof of this is their organization "Selva Negra Foundation", which has financed and supported many scientific projects for a healthier environment (http://www.mana.com.mx/english.htm).

Amauropelta manaiorum is similar to *A. ekmanii* (Figure 11, and Figure 12C, D); these species have in common their 1-pinnate laminae and nearly entire pinnae; their hastate and shallowly dissected pinnae; and their essentially glabrous leaves except in the adaxial sulci of rachises and petioles. *Amauropelta manaiorum* differs from *A. ekmanii* in having erect rhizomes and leaves ascending in tight fascicles, laminae larger than petioles, and by having setulose sporangia (Figure 12E, F), while *A. ekmanii* has long-creeping rhizomes with leaves growing distantly from one another, laminae shorter than petioles, and glabrous sporangia (Figure 12C, D).

26. ***Amauropelta ekmanii*** (A.R. Smith ex Lellinger) O. Alvarez, this dissertation, Chapter 3: 36. 2010. *Thelypteris ekmanii* A.R. Sm. ex Lellinger, Amer. Fern J. 74: 60. 1984. *Dryopteris reducta* C.Chr., Kongl. Svenska Vetensk. Acad. Handl., ser. 3, 16: 18, *t. 2, f. 1-3*. 1937; *non Thelypteris reducta* Small, Index No. Amer. Ferns 77. 1938.—TYPE: DOMINICAN REPUBLIC, **La Vega**: Valle Nuevo, *Ekman H13839* (holotype: S; isotype: US!).

DISTRIBUTION.—Endemic to the Caribbean (Greater Antilles: Hispaniola).

27. ***Amauropelta basisceletica*** (C. Sánchez, Caluff & O. Alvarez) O. Alvarez, this dissertation, Chapter 3: 34. 2010. *Thelypteris basisceletica* C. Sánchez, Caluff & O. Alvarez, Amer. Fern J. 95: 30, *f. 1*. 2005.—Type. CUBA, **Granma**: Buey Arriba, Pico La Bayamesa, *Alvarez et al. 64440* (holotype: HAJB!).

DISTRIBUTION.—Endemic to the Caribbean (Greater Antilles: Cuba).

Figure 10. *Amauropelta manaiorum*. Specimen (*Zanoni et al. 22936*, JBSD).

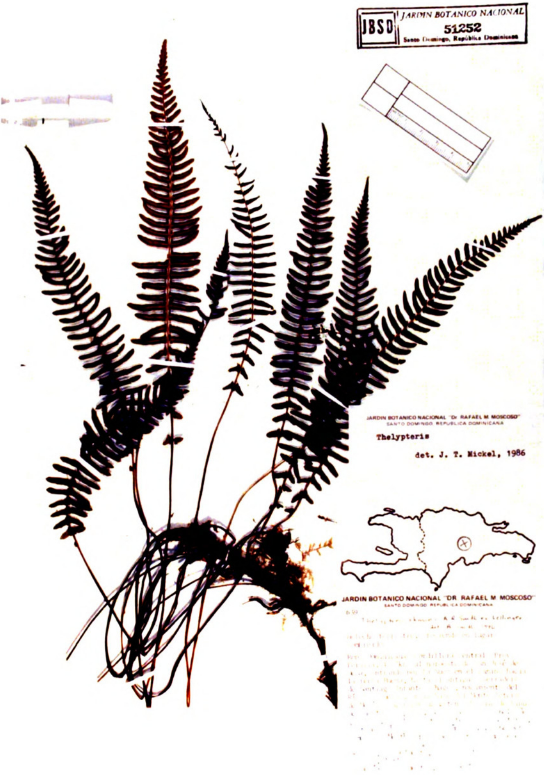


Figure 11. *Amauropelta ekmanii*. Specimen (*Mejía et al. 639*, JBSD).

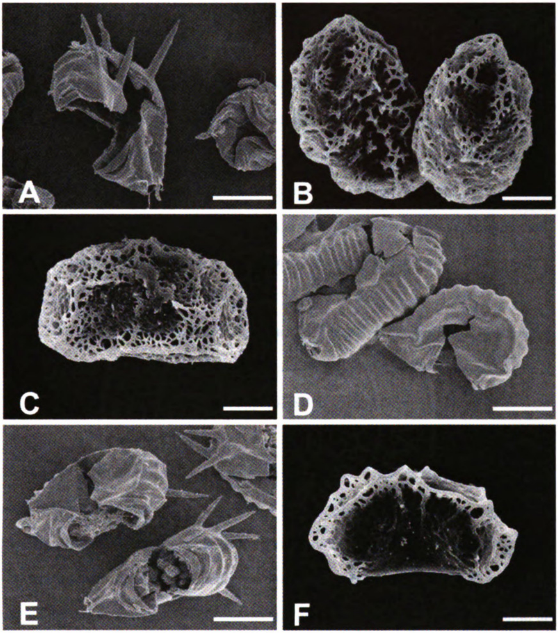


Figure 12. SEM images of sporangia and spores of *Amauropelta*. A, B. *A. aliena* (*Ekman H13657*). A. Setulose sporangia. B. Spores. C, D. *A. ekmanii* (*Ekman 5747*). C. Spore. D. Glabrous sporangia. E, F. *A. manaiorum* (*Zanoni et al. 23023*, holotype). E. Setulose sporangia. F. Spore. Scale: A, D, E, bar = 100 μm; B, C, F, bar = 10 μm.

28. ***Amauropelta deminuta*** O. Alvarez, **sp. nov.** Figure 13

Rhizoma repens; petioli rachisque glabratus vel pubeus in adaxial sulci; laminae coriacea, bipinnatus-pinnatifidus vel pinnatus-pinnatifidus, gradatim ad abrupte redacta inferiora cum dimidia pinnae usque ad 20 paribus; dimidia pinna proximalis deltatus cum trialobis pinnatifidus; lamina pagina inferiore et superiore quasi glabrata et eglandulosa; nervis valde prominens adaxialis; indusii obscurus, absens vel aliquantum persistens, auriculatus, parvulus, sparcim pubens et eglandulosus.

TYPE—DOMINICAN REPUBLIC, **Peravia:** Cordillera Central: Arroyo La Represa, en el sendero desde El Bejucal a la Loma Los Palos Mojados, valle del Río El Canal. 18°37' N, 70°35' O, *Zanoni et al. 22241* (holotype: JBSD!).

DESCRIPTION: *Rhizomes* long-creeping to erect, 1.09-2.21 cm in diameter, bearing numerous scales on apices; *scales* 6.02-9.52 mm long, 1.68-2.38 mm wide, castaneous to light brown, lustrous, lanceolate with broad bases, long-acuminate at apices, subclathrate, glabrous and eglandular. *Leaves* monomorphic, with main axis adaxially sulcate, ascending in fascicles, 41.44-101.92 cm long. *Petioles* 1.81-6.99 cm long, 1.7-2.5 mm in diameter, dark olivaceous proximally, stramineous distally, pubescent only at margins of sulci or glabrescent, hairs all acicular, 0.2-0.4 mm long, patent, eglandular, sparsely scaly, scales similar to those of the rhizomes. *Rachises* stramineous, pubescent only at margins of sulci, glabrous elsewhere, hairs all acicular, 0.2-0.8 mm long, patent to reflexed, eglandular, lacking scales. *Laminae* bipinnate-pinnatifid to pinnate-pinnatifid, thick and coriaceous, 38.84-94.93 cm long, 12.8-22 cm wide, narrowly-lanceolate, long-attenuate at bases, to deltoid-lanceolate, long-acuminate at apices, abruptly to gradually reduced proximally, 10-20 pairs of reduced proximal pinnae, most distal pairs oblong-lanceolate-pinnatifid, long-acuminate with basal segments elongate, most basal ones deltate-pinnatifid with three main lobes and the basal segments largely elongate; *laminar tissue* essentially glabrous on both sides and eglandular. *Pinnae* sessile, 6.34-10.92 cm long, 0.54-1.26 cm wide, 40-60 pairs, sub-opposite proximally to alternate, oblong-lanceolate, long-attenuate at apices, with at least one pair to none of free pinnules, with deep sinuses, proliferous bulbils absent; *aerophores* essentially absent, or else represented by an obvious swollen area; *costae* adaxially sulcate, glabrous abaxially, pubescent only at margins of adaxial sulci, hairs all acicular, 0.1-0.35 mm long, patent, eglandular and lacking costal scales; *segments* somewhat to obviously oblique, 0.13-0.28 cm wide, oblong, apices acute to cuspidate, with margins dentate-cuspidate, basal pinnules/segments obviously elongate, pinnules and segments somewhat to obviously biauriculate at bases in at least proximal third of pinnae, with basal basiscopic auricles larger than acroscopic ones, basal acroscopic pinnules/segments recurved, basal basiscopic ones with long inferior auricles, acute to cuspidate at apices, overlapping the rachises, segments strongly revolute when dried; *costa-sinus distance* 0.09-0.2 mm; *costules* essentially glabrous on both sides, eglandular, brightly reddish-stramineous, conspicuously prominent on both sides; *veins* strongly prominent adaxially, 6-8 pairs per segment, olivaceous to bright reddish-stramineous, mostly simple, bifurcate to trifurcate at basal veins, essentially glabrous on both sides, eglandular. *Sori* round and submarginal;

indusia obscure, absent to persistent, small, ear-like, light brown, sparsely hairy, bearing acicular hairs to 0.3 mm long, eglandular; *sporangia* glabrous.

DISTRIBUTION.—Endemic to the Caribbean (Greater Antilles: Hispaniola).

SELECTED SPECIMENS EXAMINED (Appendix B).

Amauropelta deminuta occurs in cloud forest in the Cordillera Central of Dominican Republic, in open places in pine forests, and near cultivated areas. The species grows in full sun or in shade at high elevation, between 1,200 and 1,585 m above sea level. The etymology of the specific epithet refers to the large number of reduced pinnae towards the bases of the leaves. *Amauropelta deminuta* and *A. basisceletica*, from Cuba, are the only two species of amauropeltoid ferns in the Caribbean with more than 15 pairs of reduced proximal pinnae; *A. deminuta* differs from *A. basisceletica* by having a smaller number, to 20 pairs, of reduced pinnae proximally, while *A. basisceletica* has up to 28 pairs (Figure 14). *Amauropelta deminuta* is nearly exindusiate, if indusiate then indusia are small, ear-like lobes, while *A. basisceletica* is obviously indusiate, with large reniform indusia, that are pubescent and marginally glandular. Both species also differ in the characteristics of axes pubescence, rhizome habit, and proximal pinna shape. *Amauropelta deminuta* has glabrescent petioles and rachises, or else is densely pubescent along adaxial sulci only, the rhizomes are long-creeping, and reduced proximal pinnae are deltate with three pinnatifid lobes. *Amauropelta basisceletica* has densely pubescent petioles and rachises, suberect to erect rhizomes, and reduced proximal pinnae irregularly stellate-laciniate and skeletal.

Amauropelta deminuta is similar to *A. rupicola* (Figure 15); however, it differs from *A. rupicola* in having from 15 to 20 pairs of reduced pinnae proximally, while *A. rupicola* has up to 15 pairs; *A. deminuta* also lacks the characteristic pattern of laminar reduction that *A. rupicola* displays, in which the most distal pair of reduced proximal pinnae is three times smaller than the pinnae pair inmediately above.

29. *Amauropelta basiattenuata* (Jenman) O. Alvarez, this dissertation, Chapter 3: 34. 2010. *Nephrodium basiattenuatum* Jenman, Gard. Chron., ser. 3, 15: 330. 1894 [or] Bull. Bot. Dept. Jamaica, n.s. 3: 20. 1896. *Aspidium basiattenuatum* (Jenman) Jenman, Gard. Chron., ser. 3, 17: 132. 1895. *Dryopteris basiattenuata* (Jenman) C.Chr., Index Filic. 254. 1905. *Thelypteris basiattenuata* (Jenman) Proctor, Brit. Fern Gaz. 10: 25. 1968.—Type. JAMAICA, **St. Andrew**: From Mount Moses, *J. P. 368* (holotype: IJ!, [photo deposited at US!]; isotype: US [fragment!]).

DISTRIBUTION.—Endemic to the Caribbean (Greater Antilles: Jamaica).

Figure 13. *Amauropelta deminuta*.Specimen (*Zanoni et al. 22241*, holotype, JBSD).

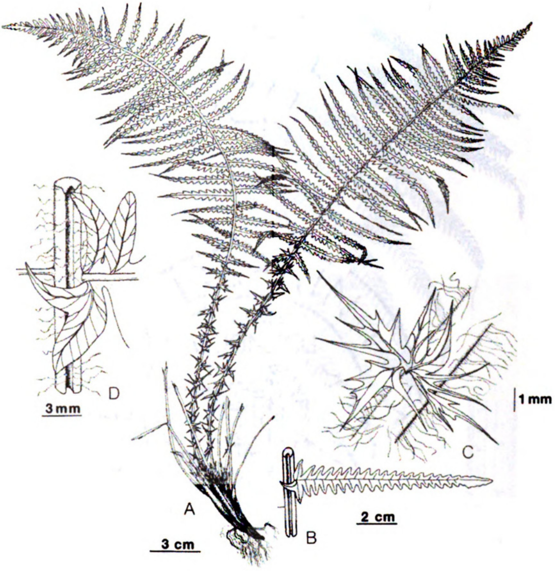


Figure 14. *Amauropelta basisceletica*. A. Habit (Based on *Ekman 5188*) B. Pinna. C. Reduced proximal pinna. D. Basal segments (adaxial surface). B–D. Based on *Alvarez et al. 64440*, holotype. Previously published in *Amer. Fern J.* (Alvarez-Fuentes & Sánchez 2005: Figure 1).

Figure 15. *Amauropelta rupicola*. Specimen (*Ekman H5705*, US).

30. ***Amauropelta namaphila*** (Proctor) O. Alvarez, this dissertation, Chapter 3: 40. 2010. *Thelypteris namaphila* Proctor, Amer. Fern J. 75: 56. 1985.—Type. PUERTO RICO, **San Germán**: Maricao State Forest, just S of Road 120 at approx. km 16.5, *Proctor 39834* (holotype: US!; isotypes: IJ!, SJ).

DISTRIBUTION.—Endemic to the Caribbean (Greater Antilles: Hispaniola and Puerto Rico).

31. ***Amauropelta sancta*** (L.) Pic. Serm., Webbia 31: 251. 1977. *Acrostichum sanctum* L., Syst. Nat., ed. 10. 2: 1320. 1759. *Polypodium sanctum* (L.) Sw., Prodr. (Swartz) 133. 1788. *Phegopteris sancta* (L.) Fée, Mém. Foug., 5. Gen. Filic. 243. 1852. *Lastrea sancta* (L.) J. Sm., Ferns Brit. For. (ed. 1) 159. 1866; *non* T. Moore 1858. *Nephrodium sanctum* (L.) Baker, Syn. Fil. (Hooker & Baker) 267. 1867. *Dryopteris sancta* (L.) Kunze, Revis. Gen. Pl. 2: 813. 1891. *Dryopteris sancta* var. *typica* C.Chr., Smithsonian Misc. Collect. 52: 379. 1909. *nom. inval. Thelypteris sancta* (L.) Ching, Bull. Fan Mem. Inst. Biol. Bot. 10: 254. 1941. *Lastrea linnaeana* Copel., Gen. Fil. (Ann. Cryptog. Phytopathol. 5) 139. 1947. *nom. illeg.*—Type. JAMAICA: Based on a plant collected in Jamaica, *Sloane*, Voy. Jamaica 1: 91, *t. 49, f. 2.* 1707 (lectotype chosen by Proctor, 1977: 277: L!).

Acrostichum cruciatum L., Sp. Pl. 2: 1072. 1753.—Type. HISPANIOLA: Based on a specimen from "l'I[s]le S. Domingue", *Plumier* (lectotype chosen by Proctor & Lourteig 1990: 385: Plumier, Filic. Amer. *t. 48, f. B.* 1703!;

isolectotypes: Plumier, Traité Foug. Amér. *t. 48, f. B.* 1705; Plumier, Descr. Pl. Amér. *t. 25, f. B.* 1693!).

Aspidium sanctum var. *portoricensis* Kuhn, Bot. Jahrb. Syst. 24: 115. 1897. *Dryopteris sancta* var. *portoricensis* (Kuhn) C.Chr., Smithsonian Misc. Collect. 52: 380. 1909. *Thelypteris sancta* var. *portoricensis* (Kuhn) C.V. Morton, Amer. Fern J. 53: 64. 1963.—Type. PUERTO RICO, **Utuado**: "in praeruptis ad los Angeles", *Sintensis 5926* (lectotype: chosen by Proctor 1989: 183: US!; isolectotype: GH!).

Dryopteris sancta var. *strigosa* C.Chr., Smithsonian Misc. Collect. 52: 379. 1909.—Type. CUBA, **Matanzas**: Mountain slope, directly N of Jaguey, *Maxon 4142* (holotype: US!).

DISTRIBUTION.—Southern Florida (USA), continental tropical America from Mexico to Honduras, and the Caribbean (Greater Antilles: Cuba, Hispaniola, Jamaica, and Puerto Rico; Lesser Antilles: Guadeloupe, Dominica, Martinique, and St. Lucia).

32. *Amauropelta rheophyta* (Proctor) O. Alvarez, this dissertation, Chapter 3: 43. 2010.

Thelypteris rheophyta Proctor, Amer. Fern J. 75: 58, *f. 2.* 1985.—Type. PUERTO RICO, **Ponce**: Barrio Anón, along Río Inabón toward base of high falls, *Proctor 40042* (holotype: US!; isotypes: IJ!, S).

DISTRIBUTION.—Endemic to the Caribbean (Greater Antilles: Hispaniola and Puerto Rico).

33. *Amauropelta physematioides* (Kuhn et H.Christ) O. Alvarez, this dissertation, Chapter 3: 42. 2010. *Aspidium physematioides* Kuhn et H.Christ, Bot. Jahrb. Syst. 24: 115. 1897. *Dryopteris physematioides* (Kuhn et H.Christ) C.Chr., Index Filic. 284. 1906.—Type. DOMINICAN REPUBLIC, **La Vega**: "Ad Valle Nuevo, in rupibus", *Eggers 2244* (lectotype designated here: B [photo deposited at US!]; isolectotype: US [fragment!]).

DISTRIBUTION.—Endemic to the Caribbean (Greater Antilles: Hispaniola).

34a. *Amauropelta piedrensis* (C.Chr.) O. Alvarez **var. *piedrensis***, this dissertation, Chapter 3: 42. 2010. *Dryopteris piedrensis* C.Chr., Smithsonian Misc. Collect. 52: 372. 1909. *Thelypteris piedrensis* (C.Chr.) C.V. Morton, Amer. Fern J. 53: 69. 1963.—Type. CUBA, **Santiago de Cuba**: Gran Piedra, Oriente, *Maxon 4041* (holotype: US!; isotypes: NY!, GH!).

DISTRIBUTION.—Endemic to the Caribbean (Greater Antilles: Cuba, Hispaniola, and Puerto Rico).

34b. *Amauropelta piedrensis* var. *heterotricha* (Caluff & C. Sánchez) O. Alvarez, this dissertation, Chapter 3: 42. 2010. *Thelypteris piedrensis* var. *heterotricha* Caluff & C. Sánchez, Willdenowia 35: 161, *f. 2A-B*. 2005.—Type. CUBA, **Santiago de Cuba**: Gran Piedra, cañada debajo del centro turístico, *Sánchez* *et al. 71243* (holotype: HAJB!; isotypes: HAJB!, B [digital photo!], BSC [as *Caluff et al. 3515, 3516*]!).

DISTRIBUTION.—Endemic to the Caribbean (Greater Antilles: Cuba).

34c. *Amauropelta piedrensis* var. *quisqueyana* O. Alvarez, **var. nov.** Figure 16

Rhizoma repens vel erecta; petiolus basis et rachia dense hispidus, pilis omnis acicularis, 0.02-0.1 mm longis; laminae coriacea, bipinnatus-pinnatifidus cum liber pinnulae usque ad 8 paribus, abrupte redacta inferiora cum dimidia pinnae proximalis usque ad 3 paribus; segmentis aliquantum vel manifesto biauriculatus basi; sparsim pubens vel glabratus in superficiebus ambadus lamina pagina, pagina inferiore sparsim globuloso-glandulosa; nervis valde promines utroque laminae latere plerumque bifurcatus; indisii obscurus, auriculatus, parvulus et caducus, sparsim pubens et marginalis globuloso-glandulosa.

TYPE—DOMINICAN REPUBLIC, **La Vega**: Cordillera Central: aprox. 5 km al suroeste de Jarabacoa (carretera a Manabao): sobre El Mogote, al sur del poblado rural de Pinar Quemado. 19°05' N, 70°40' O, *Zanoni et al. 36815* (holotype: JBSD!).

DESCRIPTION: *Rhizomes* long-creeping to erect, 1.29-1.65 cm in diameter, bearing numerous scales on apices; *scales* 4.2-8.1 mm long, 0.98-2.1 mm wide, castaneous to light brown, lustrous, linear-lanceolate to lanceolate, long-acuminate at apices, subclathrate, densely pubescent, hairs short acicular, 0.02-0.04 mm long, patent, eglandular. *Leaves* monomorphic, with main axis adaxially sulcate, ascending in fascicles, 44.99-63.73 cm long. *Petioles* 14.92-20.35 cm long, 1.7-2.8 mm in diameter, dark to light olivaceous proximally to stramineous distally, more or less densely hispid proximally, glabrescent distally, hairs all acicular, 0.04-0.1 mm long, patent, eglandular, densely to sparsely scaly, always denser at bases, scales similar to those of the rhizomes. *Rachises* olivaceous to stramineous, finely hispid on all sides, hairs all acicular, 0.02-0.1 mm long, patent, eglandular, mostly lacking scales. *Laminae* bipinnate-pinnatifid, thick and coriaceous, 37.32-43.38 cm long, 17.98-21.08 cm wide, oblong-lanceolate, short to long-acuminate at apices, abruptly reduced proximally, 1-3 pairs of reduced proximal pinnae, those oblong-lanceolate-pinnatifid, short-acuminate with basal segments elongate; *laminar tissue* glabrescent to somewhat sparsely pubescent on both sides, abaxial hairs all acicular, 0.04-0.09 mm long, patent, adaxial hairs all acicular, 0.06-0.12 mm long, mostly patent, with few sessile, globular reddish glands abaxially. *Pinnae* sessile, 8.39-10.48 cm long, 1.31-1.91 cm wide, 20-30 pairs, subopposite proximally to alternate distally, oblong-lanceolate, long-attenuate at apices, with at least two pairs of free pinnules and to 12 pairs connected by a very fine line of tissue, to 0.15 mm wide, proliferous bulbils absent; *aerophores* absent; *costae* adaxially sulcate, densely hispid on both sides, hairs all acicular, 0.04-0.08 mm long, patent to somewhat appressed, sparsely globular-glandular abaxially and lacking costal scales; *segments* somewhat to obviously oblique, 0.27-0.32 cm wide, oblong, apices acute to cuspidate, with margins deeply crenate, basal pinnules similar in size and shape to the following two pairs in the pinnae, or else elongate, pinnules and segments somewhat to obviously biauriculate at bases, basal acroscopic auricles larger than basiscopic ones; *costa-sinus distance* 0.06-0.2 mm; *costules* sparsely pubescent to glabrescent on both sides, hairs all acicular, 0.04-0.08 mm long, patent, sparsely globular-glandular abaxially, olivaceous to stramineous, conspicuously prominent on both sides; *veins* strongly prominent on both sides, 8-10 pairs per segment, olivaceous to stramineous, mostly bifurcate, sparsely pubescent to glabrescent on both sides, hairs all acicular, 0.04-0.09 mm long, patent, sparsely globular-glandular abaxially. *Sori* round and submarginal; *indusia* obscure, somewhat persistent, erect upon maturity of sporangia, light brown, sparsely hairy, bearing acicular hairs to 0.1 mm long, globular-glandular at margins; *sporangia* glabrous.

DISTRIBUTION.—Endemic to the Caribbean (Greater Antilles: Hispaniola).

SELECTED SPECIMENS EXAMINED (Appendix B).

Amauropelta piedrensis var. *quisqueyana* occurs in cloud forests at the Cordilleras Central and Septentrional. The species also grows in partial to full shade on mossy banks, at edge of pine forests or in thickets along trails; at elevations above 750 m, but mainly above 1,000 to 2,140 m. The etymology of the varietal epithet refers to the pre-Columbian name for the island of Hispaniola, given by its Taíno inhabitants. This variety occurs only in Hispaniola and differs from var. *piedrensis* (Eastern Cuba, Hispaniola, and Puerto Rico) and from var. *heterotricha* (Eastern Cuba) in having up to eight pairs of free pinnules, with segments somewhat to obviously biauriculate at bases, and veins mostly bifurcate, thick adaxially, 0.08-0.15 mm wide, and prominently raised abaxially (Figure 17A, B). *Amauropelta piedrensis* vars. *piedrensis* and *heterotricha* have no more than one pair of free pinnules, with only the basal segments auriculate, and the veins mostly simple, thin adaxially, 0.03-0.06 mm wide, and slightly raised abaxially. Additionally, the latter varieties have large and persistent reniform indusia, while *A. piedrensis* var. *quisqueyana* has small, sometimes deciduous, ear-like lobes of indusial tissue.

35. *Amauropelta hastiloba* (C.Chr.) O. Alvarez, this dissertation, Chapter 3: 38. 2010.

Dryopteris hastiloba C.Chr., Kongl. Svenska Vetensk. Acad. Handl., ser. 3, 16: 20, *t. 4, f. 4-5*. 1937.—Type. HAITI, **Sud-Est**: Massif de la Selle, Pétionville, northern slope of Morne La Visite, *Ekman H7989* (holotype: S; isotype: US!).

DISTRIBUTION.—Endemic to the Caribbean (Greater Antilles: Hispaniola).

36a. *Amauropelta scalpturoides* (Fée) O. Alvarez **var. *scalpturoides***, this dissertation, Chapter 3: 45. 2010. *Phegopteris scalpturoides* Fée, Mém. Foug., 11. Hist. Foug. Antil. 51-52. 1866. *Dryopteris scalpturoides* (Fée) C.Chr., Index Filic. 291. 1905. *Thelypteris scalpturoides* (Fée) C. F. Reed, Phytologia 17: 313. 1968.—Type. CUBA: Cuba Orientali 1856-7, *Wright 820* (lectotype chosen by Alvarez-Fuentes & Sánchez, 2005: 43: G-Herb. De Candolle!; isolectotypes: G[2]!, GH!).

DISTRIBUTION.—Endemic to the Caribbean (Greater Antilles: Cuba).

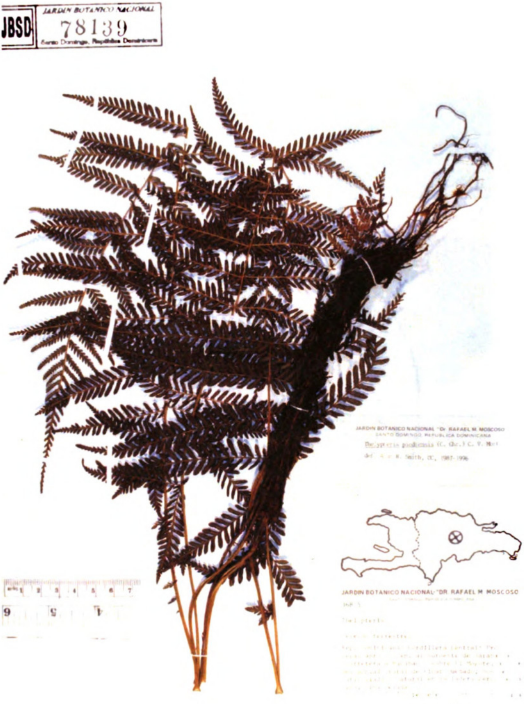


Figure 16. *Amauropelta piedrensis* var. *quisqueyana*. Specimen (*Zanoni et al. 36815*, holotype, JBSD).

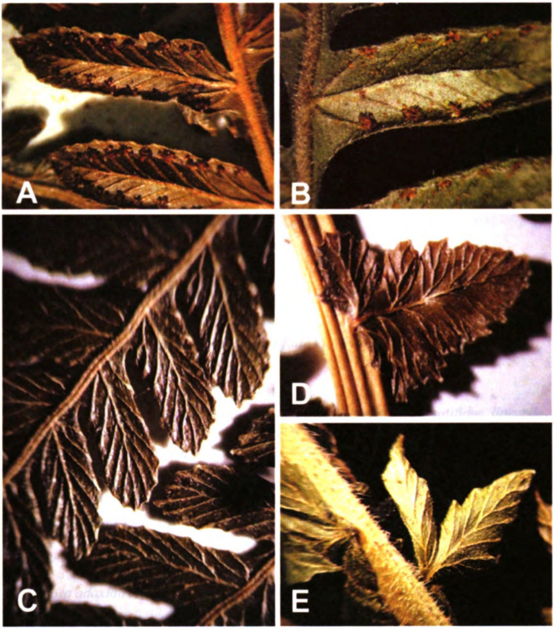


Figure 17. A. Free pinnules (abaxial surface) of *Amauropelta piedrensis* var. *quisqueyana* (*Zanoni et al. 36815*, holotype). B. Segment (abaxial surface) of *A. piedrensis* var. *piedrensis* (*Serguera 507*). C, D. *A. flabellata* (*Ekman H12041*, holotype). C. Partial pinnae showing prominent veins on adaxial surface. D. Reduced proximal pinna. E. Reduced proximal pinnae of *A. rupicola* (*Alvarez-Fuentes & Clase 699*).

36b *Amauropelta scalpturoides* var. *glabriuscula* (C. Sánchez & Caluff) O. Alvarez, this dissertation, Chapter 3: 45. 2010. *Thelypteris scalpturoides* var. *glabriuscula* C. Sánchez & Caluff, Willdenowia 35: 163, *f. 2C.* 2005.—Type. CUBA, **Holguín**: Moa, Parque Nacional "Alexandro de Humboldt" Meseta del Toldo a 3 km al N del campamento minero (pasando por la montaña "La Pelúa"), *Sánchez & Risco HFC 77885* (holotype: HAJB!; isotypes: B [digital photo!], BSC!).

DISTRIBUTION.—Endemic to the Caribbean (Greater Antilles: Cuba).

36c. *Amauropelta scalpturoides* var. *angustifolia* O. Alvarez, **var. nov.** Figure 18

Rhizoma erecta; laminae coriacea, 1-pinnatus aliquantum pinnatifidus, linearis-lanceolata longiacuminatus apicem versus, gradatim redacta inferiora; dimidia pinnae proximalis, 6-15 paribus, deltato-breviacuminata, basi hastatae ad marginem crenatus; pinnae lanceolatus vadi dissecta, basi hastatae; segmentis basalis duplo longa quam secundum pinna segmentis; lamina pagina abaxialis dense pubens et globuloso-glandulosa adaxialis dense vel sparsim pubens et egalndulosus; nervis valde promines adaxialis; indusii manifestus et reniformis et persistens, sparsim pubens cum pilis omnis acicularis usque ad 0.15 mm longis, marginalis globuloso-glandulosus.

TYPE—CUBA, **Pinar del Río**: N slope of Loma Pelada de Buenavista, Cayajabos, *Leon 13563* (holotype: NY!; isotype: US!).

DESCRIPTION: *Rhizomes* erect, 1.11-1.79 cm in diameter, sparsely scaly on apices; *scales* 2.4-5.4 mm long, 0.84-0.96 mm wide, castaneous to light brown, lustrous, linear-lanceolate to lanceolate, long-acuminate at apices, subclathrate, pubescent, hairs short acicular, 0.04-0.08 mm long, patent, eglandular. *Leaves* monomorphic, with main axis adaxially sulcate, ascending in fascicles, 22.83-27.65 cm long. *Petioles* 2.29-4.51 cm long, 0.7-0.9 mm in diameter, dark olivaceous proximally to light olivaceous, or stramineous distally, more or less densely hispid on all sides, hairs all acicular, 0.1-0.3 mm long, patent, eglandular, sparsely scaly, scales similar to those of the rhizomes. *Rachises* light olivaceous to stramineous, densely pubescent on all sides, hairs all acicular, 0.2-0.65 mm long, patent, ciliform, sparsely capitate glandular, lacking scales. *Laminae* pinnate and somewhat pinnatifid, thick and coriaceous, 19.09-23.57 cm long, 2.23-3.89 cm wide, linear-lanceolate, long-acuminate at apices, gradually reduced proximally, 6-15 pairs of reduced proximal pinnae, those deltate and hastate at bases with margins crenate, short-acuminate; *laminar tissue* densely pubescent abaxially, abaxial hairs all acicular, 0.15-0.25 mm long, patent, somewhat densely to sparsely pubescent adaxially, adaxial hairs all acicular, 0.15-0.25 mm long, mostly patent, some appressed, densely to sparsely glandular abaxially, glands sessile, globular and reddish. *Pinnae* sessile, 1.45-1.90 cm long, 0.62-0.82 cm wide, 20-30 pairs, subopposite proximally to alternate distally, lanceolate with margins crenate to dentate, hastate at bases, short-attenuate at apices, with medium sinuses, proliferous bulbils absent; *aerophores* absent; *costae* adaxially sulcate, densely pubescent abaxially, hairs all acicular, 0.2-0.4 mm long, patent, sparsely pubescent along margins of adaxial sulci, hairs all acicular, 0.1-0.2 mm long, patent, sparsely globular-glandular abaxially and lacking costal scales; *segments* somewhat to obviously oblique, 0.19-0.28 cm wide, deltate, apices acute to obtuse, with margins entire, basal segments obviously elongate, two times larger than the second pair of segments, acute at apices; *costa-sinus distance* 0.7-1.45 mm; *costules* sparsely pubescent on both sides, hairs all acicular, abaxial hairs 0.15-0.3 mm long, patent, adaxial hairs 0.1-0.15 mm long, sparsely globular-glandular abaxially or eglandular, olivaceous to stramineous, conspicuously prominent adaxially; *veins* strongly prominent adaxially, 3-4(-5) pairs in basal segments only, olivaceous to stramineous, mostly bi- to trifurcate reaching the margins of pinnae distal to the sinuses, simple in basal segments, sparsely pubescent on both sides, hairs all acicular, abaxial hairs 0.1-0.25 mm long, patent, adaxial hairs 0.1-0.2 mm long, patent to somewhat appressed, sparsely globular-glandular abaxially or eglandular. *Sori* round and submarginal; *indusia* obvious, persistent, reniform, light brown, sparsely hairy, bearing acicular hairs to 0.15 mm long, globular-glandular at margins; *sporangia* glabrous.

DISTRIBUTION.—Endemic to the Caribbean (Greater Antilles: Cuba).

SELECTED SPECIMENS EXAMINED (Appendix B).

Amauropelta scalpturoides var. *angustifolia* occurs in thickets on serpentine derived soils or pine forests in Western Cuba; it grows in partial shade to full sunlight at about 200 m.

Amauropelta scalpturoides varies in both hair size and density, as well as in the presence and distribution of sessile globular glands abaxially, either at margins of indusia or on laminar tissue. Only recently (Alvarez-Fuentes & Sánchez 2005b; Sánchez & Caluff 2005; Sánchez & al. 2006) have we begun to understand this species, which is endemic to Cuba.

Two varieties have been recognized for Cuba, *A. scalpturoides* var. *scalpturoides* and *A. scalpturoides* var. *glabriuscula*; a third variety is described here, *A. scalpturoides* var. *angustifolia*, named for the linear-lanceolate shape of its blades. The new variety differs from vars. *scalpturoides* and *glabriuscula* in having linear-lanceolate leaves, with lanceolate pinnae that are hastate at bases, basal segments two times larger than the following segments in the pinnae, and by having shallowly dissected pinnae.

Varieties *scalpturoides* and *glabriuscula* have ovate, oblong-ovate, or oblong-lanceolate leaves, with oblong-lanceolate pinnae that are not hastate at bases, with basal segments slightly larger than the following segments in the pinnae, and in having deeply dissected pinnae.

Previous studies of Caribbean thelypteroid ferns (Christensen 1937) included Hispaniola in the range of *A. scalpturoides*; however, after careful examination of several specimens from Haiti and Dominican Republic, I conclude that specimens collected from Hispaniola and previously attributed to *A. scalpturoides* belong to *A. rupicola.*

Figure 18. *Amauropelta scalpturoides* var. *angustifolia*. Specimen (*Wright 3925*, US).

37. *Amauropelta flabellata* O. Alvarez, **sp. nov.** Figure 19

Rhizoma repens vel erecta cum paleis deltato-lanceolata factus basalis interdum plicates; petioli costulae nervisque glabratus, rachis costaeque pubens non nisi in sulco adaxialis; laminae coriacea, pinnatus-pinnatifidus vel bipinnatus-pinnatifidus, si bipinnatus nunc cum unico liber pinnularum, abrupte redacta inferiora; dimidia pinnae proximalis plerumque deltato-quinquelobus ad marginem dentato-cuspidata, cum omnis axes (costae et costulae et nervis) plus minusve aequus crassum basilaris nervisque ramosi basaliter e costae basis exorientia; quasi glabratus et eglandulosus in superficiebus ambadus lamina pagina; segmentis ad marginem dentato-cuspidata; nervis valde promines adaxialis plerumque bifurcatus vel trifurcatus; indusii obscurus, auriculatus, parvulus et caducus, sparsim pubens plerumque eglandulosus.

TYPE—DOMINICAN REPUBLIC, **Azua**: Sierra de Ocoa, San José de Ocoa, Bejucal, *Ekman H12041* (holotype: US!).

DESCRIPTION: *Rhizomes* short-creeping to erect, 1.02-2.94 cm in diameter, bearing numerous scales on apices; *scales* 4.2-7 mm long, 1.4-2.8 mm wide, castaneous to light brown, lustrous, bullate to widely deltate, acuminate at apices, subclathrate, sparsely pubescent, hairs acicular, 0.06-0.1 mm long, patent, eglandular. *Leaves* monomorphic, with main axis adaxially sulcate, ascending in fascicles, 50.75-75.97 cm long. *Petioles* 0.96-6.53 cm long, 1.7-2.4 mm in diameter, dark olivaceous proximally, light olivaceous to stramineous distally, glabrous on all sides, eglandular, sparsely scaly, scales similar to those of the rhizomes. *Rachises* olivaceous to stramineous, pubescent only at margins of sulci, glabrous elsewhere, hairs all acicular, 0.2-0.54 mm long, patent to reflexed, eglandular, small, deciduous scales may be present at adaxial pinna bases, scales 0.6 mm long, 0.1 mm wide, lustrous, linear-lanceolate to lanceolate, acuminate at apices, clathrate, glabrous and eglandular. *Laminae* bipinnate-pinnatifid to pinnate-pinnatifid, thick and coriaceous, 54.84-69.44 cm long, 11.48-15.93 cm wide, deltoid-lanceolate, acuminate at apices, abruptly reduced proximally, 7-14 pairs of reduced proximal pinnae, most distal pairs oblong-lanceolate-pinnatifid, short-acuminate with basal segments somewhat elongate, most basal ones deltate or deltate-pentalobate, with margins dentate-cuspidate; *laminar tissue* essentially glabrous on both sides, if some hairs present all acicular, 0.06-0.08 mm long, patent, mostly eglandular or sparsely glandular abaxially, glands sessile, globular and reddish. *Pinnae* sessile, 7.63-7.90 cm long, 1.04-1.20 cm wide, 30-40 pairs, alternate, oblong-lanceolate, long-attenuate at apices, one pair to none of non-excurrent pinnules, with deep sinuses, proliferous bulbils absent; *aerophores* essentially absent, or else, very small and obscure; *costae* adaxially sulcate, glabrous abaxially, pubescent only at margins of adaxial sulci, hairs all acicular, 0.08-0.35 mm long, patent, eglandular and lacking costal scales; *segments* somewhat to obviously oblique, 0.19-0.23 cm wide, oblong, apices acute to cuspidate, with margins dentate-cuspidate, basal pinnules similar in size and shape to the following two pairs in the pinnae, or else slightly elongate, basal acroscopic pinnules/segments recurved, basal basiscopic ones oblong-spatulate, deeply dentate-cuspidate, with long inferior auricles overlapping the rachises; *costa-sinus distance* 0.12-0.24 mm; *costules* glabrescent to glabrous on both sides, if some hairs present, all acicular, 0.06-0.08 mm long, patent, eglandular, olivaceous to stramineous, conspicuously prominent on both sides; *veins* strongly prominent adaxially, 5-7 pairs per segment, olivaceous to stramineous, mostly bifurcate to trifurcate, glabrescent to glabrous on both sides, if some hairs present, all acicular, 0.05-0.08 mm long, patent, eglandular. *Sori* round and submarginal; *indusia* obscure, somewhat persistent, small, ear-like, light brown, sparsely hairy, bearing acicular hairs to 0.3 mm long, mostly eglandular and rarely globular-glandular at margins; *sporangia* glabrous.

DISTRIBUTION.—Endemic to the Caribbean (Greater Antilles: Hispaniola).

SELECTED SPECIMENS EXAMINED (Appendix B).

Amauropelta flabellata appears at the edge of wet montane forests in the Cordillera Central of the Dominican Republic. The species also occurs in riparian forests, open places like pastureland, or as part of the understory of pine forests, in partial shade to full sunlight; at elevations between 1,200 and 1800 m above sea level. The etymology of the specific epithet refers to the palmately-pinnate appearance of its reduced proximal pinnae. This species is similar to *A. rupicola*; however, *A. flabellata* can be distinguished from *A. rupicola* by the presence of deltate, or deltate-pentalobate, reduced pinnae at laminar bases with dentate-cuspidate margins (Figure 17D), while *A. rupicola* has oblong-lanceolate to deltate-trilobate reduced pinnae with crenate, or slightly crenate, margins (Figure 17E). *Amauropelta flabellata* also has reduced proximal pinnae with all vascular axes of about equal thickness and basal veins basally bifurcate (giving the

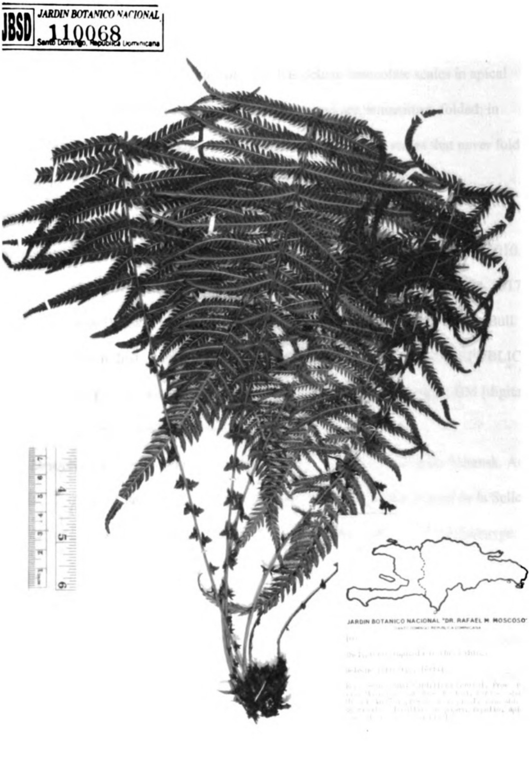


Figure 19. *Amauropelta flabellata*. Specimen (*De la Cruz & Veloz 160*, JBSD).

appearance of palmately-pinnate pinnae) while *A. rupicola* has reduced proximal pinnae with costae thicker than costules and costules thicker than veins with basal veins not bifurcate at base. *Amauropelta flabellata* also has deltate-lanceolate scales in apical portions of rhizomes; these scales have broad bases and are, sometimes, folded; in contrast, *A. rupicola* has lanceolate to linear-lanceolate rhizome scales that never fold proximally.

38. *Amauropelta rupicola* (C.Chr.) O. Alvarez, this dissertation, Chapter 3: 44. 2010.

Dryopteris rupicola C.Chr., Repert. Spec. Nov. Regni Veg. 15: 24. 1917; *non* Hosok. 1936, *nom. illeg. Thelypteris rupicola* (C.Chr.) Ching, Bull. Fan Mem. Inst. Biol. Bot. 10: 254. 1941.—Type. DOMINICAN REPUBLIC, **La Vega**: "ad Valle Nuevo, in rupibus", *Eggers 2157* (holotype: BM [digital photo!]; isotype: B [digital photo!]).

Dryopteris scalpturoides var. *subbipinnata* C.Chr., Kongl. Svenska Vetensk. Acad. Handl., ser. 3, 16: 20. 1937.—Type. HAITI, **Sud-Est**: Massif de la Selle, Croix-des-Bouquets, Badeau, near the source, *Ekman H7733* (holotype: S; isotypes: IJ!, NY!, US!).

DESCRIPTION: *Rhizomes* long-creeping to suberect, 1.31-1.57 cm in diameter, bearing numerous scales at apices; *scales* 7.14-10.08 mm long, 1.26-1.68 mm wide, castaneous to light brown, lustrous, linear-lanceolate to somewhat deltate-lanceolate, long-acuminate at apices, subclathrate, densely pubescent, hairs short acicular, 0.06-0.08 mm long, patent, eglandular. *Leaves* monomorphic, with main axis adaxially sulcate, ascending mostly in fascicles, 35.31-53.32 cm long. *Petioles* 6.35-13.21 cm long, 1.3-2.9 mm cm in diameter, dark olivaceous proximally, olivaceous to stramineous distally, more or less densely hispid on all sides, to densely hispid proximally only, to pubescent only along adaxial sulci, hairs all acicular; two type of hairs can be present, short-rigid hairs 0.02-0.1 mm long, patent, long-flexible hairs 0.16-0.45 mm long, eglandular, densely to sparsely scaly, always denser proximally, scales similar to those of the rhizomes. *Rachises* olivaceous to stramineous, eglandular, finely hispid on all sides, or pubescent only on adaxial sulci, or finely hispid with short-rigid hairs, 0.02-0.15 mm long, and longer, flexible, hairs densely to sparsely interspersed abaxially, long-flexible hairs 0.16-0.3 mm long, hairs all acicular, patent, deciduous scales may be present at adaxial pinna bases, small, castaneous, lustrous, linear-lanceolate, clathrate, pubescent and eglandular. *Laminae* bipinnate-pinnatifid to pinnate-pinnatifid, thick and coriaceous, 22.18-40.62 cm long, 15.97-21.81 cm wide, oblong-lanceolate to deltate-lanceolate, long-acuminate at apices, abruptly reduced proximally, 4-10 pairs of reduced proximal pinnae, those oblong-lanceolate-pinnatifid, short-acuminate with basal segments obviously elongate, most basal ones deltate-trilobate or narrowly oblong-lanceolate, short-attenuate at apices, with a free segment sometimes; *laminar tissue* essentially glabrous on both sides, except in lowermost reduced proximal pinnae, to sparsely pubescent abaxially and glabrous adaxially, abaxial hairs, when present, all acicular, 0.04-0.09 mm long, patent, adaxial hairs, when present, all acicular, 0.04-0.08 mm long, mostly patent to appressed, with few sessile, globular yellowish glands on both sides, glands deciduous. *Pinnae* sessile, 7.91-10.76 cm long, 1.07-2.05 cm wide, 30-35 pairs, subopposite proximally to alternate distally, oblong-lanceolate, long-attenuate at apices, with at least one free pinnule to two pairs of non-excurrent pinnae, or with 4 to 8 pairs of free pinnules, proliferous bulbils absent; *aerophores* absent; *costae* adaxially sulcate, densely pubescent on both sides, abaxial hairs all acicular, 0.06-0.4 mm long, patent, adaxial hairs all acicular, 0.06-0.1 mm long, patent to somewhat appressed, mostly eglandular, may be sparsely globular-glandular abaxially, costal scales lacking; *segments* somewhat to obviously oblique, 0.19-0.39 cm wide, oblong, apices acute to cuspidate, with margins entire to crenate, sometimes strongly revolute, basal pinnules/segments elongate, basal basiscopic obviously auriculate at bases, auricles deltate, acute at apices, somewhat to obviously biauriculate at bases, basal basiscopic auricles larger than acroscopic ones, always overlapping the rachises, proximal segments basally auriculate to biauriculate to none; *costa-sinus distance* 0.08-0.25 mm; *costules* sparsely pubescent to glabrescent on both sides, hairs all acicular, abaxial hairs 0.06-0.15 mm long, patent, adaxial hairs 0.04-0.1 mm long, mostly eglandular to sparsely globular-glandular abaxially, obviously stramineous and conspicuously prominent on both sides; *veins* strongly prominent on both sides, 6-10 pairs per segment, obviously stramineous to orangish, contrasting highly with the dark laminae, mostly simple, bifurcate on abaxial side of segments, sparsely pubescent to glabrescent on both sides, hairs all acicular, 0.04-0.15 mm long, patent, mostly eglandular to sparsely globular-glandular abaxially. *Sori* round and submarginal; *indusia* obscure, absent to persistent, small, ear-like, light brown, sparsely hairy or glabrescent, bearing acicular hairs to 0.15 mm long, mostly eglandular to sparsely globular-glandular at margins; *sporangia* glabrous. Figure 15.

DISTRIBUTION.—Endemic to the Caribbean (Greater Antilles: Hispaniola).

SELECTED SPECIMENS EXAMINED (Appendix B).

A full description of *A. rupicola* is provided here to clarify its status as a distinct species. In 1937, Christensen reevaluated the taxonomic position of his *Dryopteris rupicola* to reduce it to a variety of *D. scalpturoides*. *Amauropelta rupicola* and *A. scalpturoides* are very similar morphologically but they differ in several characters as described here. Among the characters shared by these two species are the coriaceous texture of their laminae and the presence of strongly prominent adaxial veins. *Amauropelta rupicola* however, has thicker veins adaxially (0.08-0.12 mm wide) than *A. scalpturoides* (0.04-0.06 mm wide); *A. rupicola* has small, deciduous and obscure indusia while *A. scalpturoides* has large, persistent and reniform indusia. The two species also show different patterns for proximal laminar reduction: in *A. rupicola* the laminae decrease abruptly and the most distal pair of reduced proximal pinnae is three times smaller than the pinnae pair immediately above; in *A. scalpturoides*, however, pinna reduction occurs gradually and the most distal pair of reduced proximal pinnae is never three times smaller than the pinnae pair immediately above.

Amauropelta rupicola shows high degree of variability in several characters, e.g., pubescence of laminar axes, the number of free pinnule pairs per pinnae, rhizome habit, petiole size, and the presence of few globular glands on laminar tissue; it is, however, extremely difficult to confidently separate the species *A. hastiloba*, *A. flabellata*, and *A. deminuta* from *A. rupicola* because they are very similar to each other. These four species have in common the presence of strongly prominent adaxial veins that are thicker than those on other Caribbean species of the genus.

Amauropelta rupicola differs from *A. hastiloba* in having the basal segments of pinnae obviously elongate, 4 to 10 pairs of reduced proximal pinnae, and by lacking costal scales abaxially, while *A. hastiloba* has basal pinna segments reduced, or about the same size as the neighboring 2-3 pairs, 2 to 4 pairs of reduced proximal pinnae, and having a few linear and clathrate scales in costae abaxially. Additionally, *A. hastiloba* plants are larger than *A. rupicola* plants and, although both species have laminae that decrease abruptly proximally, the pattern of such reduction is subtly different. In *A. rupicola* the most distal pair of reduced proximal pinnae is three times smaller than the pair immediately above, while in *A. hastiloba* the most distal pair of reduced proximal pinnae is about the same size as the pair immediately above.

Differences of *A. rupicola* with *A. flabellata* and *A. deminuta* are discussed elsewhere in this chapter.

39. *Amauropelta gracilenta* (Jenman) O. Alvarez, this dissertation, Chapter 3: 38. 2010. *Polypodium gracilentum* Jenman, Bull. Bot. Dept. Jamaica, n.s. 4: 129. 1897. *Dryopteris gracilenta* (Jenman) C.Chr., Index Filic. 268. 1905. *Thelypteris gracilenta* (Jenman) Proctor, Amer. Fern J. 71: 60. 1981.—Type. JAMAICA: *Jenman s.n.* (holotype: NY!).

Dryopteris underwoodiana Maxon, Amer. Fern J. 18: 49. 1928. *Thelypteris underwoodiana* (Maxon) Ching, Bull. Fan Mem. Inst. Biol. Bot. 10: 255. 1941.—Type. JAMAICA, **St. Andrew**: From the vicinity of St. Helen's Gap, near Cinchona, *Maxon & Killip 635* (holotype: US!; isotypes: BM, GH!).

Thelypteris harrisii Proctor, Amer. Fern J. 71: 59. 1981.—Type. JAMAICA, **St. Andrew & Portland**: Moody's Gap, *Harris 7430* (holotype: IJ!; isotypes: BM, K, NY!).

DISTRIBUTION.—Endemic to the Caribbean (Greater Antilles: Jamaica).

40. ***Amauropelta nockiana*** (Jenman) Pic. Serm., Webbia 31: 251. 1977. *Nephrodium nockianum* Jenman; J. Bot. 24: 270. 1886. *Dryopteris nockiana* (Jenman) C.Chr., Index Filic. 279. 1905. *Lastrea nockiana* (Jenman) Copel., Gen. Fil. (Ann. Cryptog. Phytopathol. 5) 139. 1947. *Thelypteris nockiana* (Jenman) Proctor, Bull. Inst. Jamaica, Sci. Ser. 5: 61. 1953.—Type. JAMAICA, **St. Catherine**: Hollymount, *Sherring 23* (holotype: K; isotype: US!).

Dryopteris scalpturoides var. *jamaicensis* C.Chr., Kongel. Danske Vidensk. Selsk. Skr., Naturvidensk. Math. Afd., ser. 7, 4: 299. 1907.—Type. JAMAICA, **St. Catherine**: Mount Diabolo, *Underwood 1826* (holotype: ?; isotype: NY [fragment], US!).

DISTRIBUTION.—Endemic to the Caribbean (Greater Antilles: Jamaica).

41. ***Amauropelta shaferi*** (Maxon & C.Chr.) O. Alvarez, this dissertation, Chapter 3: 45. 2010. *Dryopteris shaferi* Maxon & C.Chr., Amer. Fern J. 4: 77. 1914. *Thelypteris shaferi* (Maxon & C.Chr.) Duek, Adansonia, ser. 2, 11: 719.

1972.—Type. CUBA, **Holguín**: "Oriente, vicinity of Camp San Benito", *Shafer 4037* (holotype: US!).

DISTRIBUTION.—Endemic to the Caribbean (Greater Antilles: Cuba).

IX. Section **Amauropelta**

Amauropelta sect. ***Amauropelta*** (A.R. Sm.) O. Alvarez, **comb. nov.** *Thelypteris* subg. *Amauropelta* sect. *Amauropelta* A.R. Sm., Amer. Fern J. 64: 90. 1974.—Type: *Amauropelta breutelii* Kunze [≡ *Amauropelta limbata* (Sw.) Pic. Serm.].

Rhizomes suberect to (mostly) erect. *Laminae* gradually reduced proximally, with many pairs of reduced proximal pinnae; *laminar tissue* with straight acicular hairs or glabrous, with sessile globular glands or eglandular; *hairs* on rachises and costae not fasciculate, more or less evenly distributed. *Aerophores* present or absent, mostly absent at costular bases. *Sori* medial, submarginal or marginal; *indusia* reniform and often glandular, always present; *sporangia* glabrous.

Around 30 species, with seven species occurring in the Caribbean.

42. ***Amauropelta limbata*** (Sw.) Pic. Serm., Webbia 31: 251. 1977. *Aspidium limbatum* Sw., J. Bot. (Schrader) 1800 (2): 35. 1801. *Nephrodium limbatum* (Sw.) Desv., Mém. Soc. Linn. Paris 6: 260. 1827. *Lastrea limbata* (Sw.) T. Moore, Index Fil. (T. Moore) 95. 1858. *Dryopteris limbata* (Sw.) Kuntze, Revis. Gen. Pl. 2: 813. 1891. *Thelypteris limbata* (Sw.) Proctor, Rhodora 61: 306. 1959 [1960].—Type. GUADELOUPE: *Fahlberg s.n.* (holotype: S ?; isotype: US [fragment!]).

Amauropelta breutelii Kunze, Farrnkräuter 1: 109, *t. 51.* 1843. *Lastrea breutelii* (Kunze) T. Moore, Index Fil. (T. Moore) 59. 1857.—Type. ST. KITTS: *Breutel s.n.* (holotype: ?; isotype: US [fragment!]).

DISTRIBUTION.—Endemic to the Caribbean (Lesser Antilles: Saba, St. Kitts, Nevis, Guadeloupe, Martinique, and St. Vincent).

43. *Amauropelta cooleyi* (Proctor) O. Alvarez, this dissertation, Chapter 3: 35. 2010.

Thelypteris cooleyi Proctor, Rhodora 68: 468. 1966.—Type. ST. VINCENT, **St. David**: Upper outer slopes of the Soufriere, *Proctor 26008* (holotype: IJ!; isotypes: A!, GH!, U [digital photo!], US!).

Dryopteris consanguinea var. *aequalis* C.Chr., Smithsonian Misc. Collect. 52: 380. 1909 (with regard to Grenada citation only, no additional type designated [Proctor 1977]).

DISTRIBUTION.—Endemic to the Caribbean (Lesser Antilles: Grenada (Proctor 1977) and St. Vincent).

44. ***Amauropelta consanguinea*** (Fée) O. Alvarez, this dissertation, Chapter 3: 35. 2010.

Aspidium consanguineum Fée, Mém. Foug., 11. Hist. Foug. Antil. 76, *t. 20, f. 3*. 1866. *Dryopteris consanguinea* (Fée) C.Chr., Kongel. Danske Vidensk. Selsk. Skr., Naturvidensk. Math. Afd., ser. 7, 4: 297. *f. 21*. 1907. *Thelypteris consanguinea* (Fée) Proctor, Rhodora 61: 306. 1959 [1960].—Type. GUADELOUPE: *L'Herminier 10* (holotype:?, not found at P; isotypes: B [digital photo! – Herb. Mett.], IJ!).

DISTRIBUTION.—Endemic to the Caribbean (Greater Antilles: Puerto Rico; Lesser Antilles: Guadeloupe, Dominica, Martinique, and Grenada).

45a. ***Amauropelta balbisii*** (Spreng.) O. Alvarez **var.** ***balbisii***, this dissertation, Chapter 3: 33. 2010. *Polypodium balbisii* Spreng., Nova Acta Phys.-Med. Acad. Caes. Leop.-Carol. Nat. Cur. 10: 228. 1821. *Aspidium balbisii* (Spreng.) Kuhn, J. Bot. 15: 231. 1877. *Dryopteris balbisii* (Spreng.) Urb., Symb. Antill. (Urban). 4: 14. 1903. *Dryopteris sancta* var. *balbisii* (Spreng.) C.Chr., Kongel. Danske Vidensk. Selsk. Skr., Naturvidensk. Math. Afd., ser. 7, 4: 296, *f. 20*. 1907. *Thelypteris balbisii* (Spreng.) Ching, Bull. Fan Mem. Inst. Biol. Bot. 10: 250. 1941.—Type: PUERTO RICO: *Bertero* (as *Bertier*) *s.n.* (holotype: **lost** [*fide* Morton 1963]); Neotype: DOMINICA: Along Castle Bruce track, vicinity of N bases of Trois Pitons, *Hodge & Hodge 1203* (neotype chosen by Proctor, 1977: 281: GH!).

Aspidium sprengelii Kaulf., Flora 6: 365. 1823. *nom. illeg. Lastrea sprengelii* (Kaulf.) C. Presl, Tent. Pterid. 75. 1836. *Nephrodium sprengelii* (Kaulf.) Hook., Sp. Fil. 4: 94. 1862. *Dryopteris sprengelii* (Kaulf.) Kuntze, Revis. Gen. Pl. 2: 813. 1891. *Thelypteris sprengelii* (Kaulf) Proctor, Bull. Inst. Jamaica, Sci. Ser. 5: 65. 1953.—Type. MARTINIQUE: "Ins. Martinica", *Sieber 355* (holotype: B [digital photo!]; isotypes: B [digital photo!], GH!).

Aspidium berteroanum Fée, Mém. Foug., 11. Hist. Foug. Antil. 77, *t. 22, f. 1.* 1866; *non* Colla 1836.—Type. GUADELOUPE: Grande Terre?, *L'Herminier 13* (holotype: P [digital photo!]).

Nephrodium sherringii Jenman, J. Bot. 17: 261. 1879. *Dryopteris sprengelii* var. *sherringii* (Jenman) C.Chr., Kongel. Danske Vidensk. Selsk. Skr., Naturvidensk. Math. Afd., ser. 7, 10: 126, 145. 1913.—Type: JAMAICA: *Jenman 1* (holotype: K).

Dryopteris harcourtii Domin, Bull. Misc. Inform. Kew 7: 219. 1929. *Thelypteris harcourtii* (Domin) Ching, Bull. Fan Mem. Inst. Biol. Bot. 10: 251. 1941.—Type. DOMINICA: "Habitat in sylvis antiquis insulae Dominicae haud procul ab oppido Roseau", 1926, *Domin s.n.* (holotype: K).

Dryopteris sprengelii var. *mollipilosa* C.Chr., Kongl. Svenska Vetensk. Acad. Handl., ser. 3, 16: 23. 1937.—Type. HAITI, **Nord**: Massif du Nord, Valliére, slope of Morne Salnave, *Ekman H 9928* (lectotype chosen by Alvarez-Fuentes & Sánchez, 2005: 36: S!).

DISTRIBUTION.—Continental tropical America from Mexico to Guyana, Trinidad and Tobago, from Ecuador (including Galapagos Islands) to Bolivia, and the Caribbean (Greater Antilles: Cuba, Hispaniola, Jamaica, and Puerto Rico; Lesser Antilles: Saba, St. Kitts, Nevis, Montserrat, Guadeloupe, Dominica, Martinique, St. Lucia, St. Vincent, and Grenada).

45b. *Amauropelta balbisii* var. *longipilosa* (C.Chr.) O. Alvarez, this dissertation, Chapter 3: 34. 2010. *Dryopteris sprengelii* var. *longipilosa* C.Chr., Kongl. Svenska Vetensk. Acad. Handl., ser. 3, 16: 23. 1937. *Thelypteris balbisii* var. *longipilosa* (C.Chr.) C. Sánchez, O. Alvarez & Caluff, Amer. Fern J. 95: 40, *f. 6 C, D.* 2005.—Type. HAITI, **Sud**: Massif de la Hotte, western group, Torbec, Les Platons, at the source, *Ekman H 7416* (holotype: S!; isotype: US!)

Dryopteris mercurii A. Braun ex Hieron., Hedwigia 46: 335, *t. 5, f. 9.* 1907. *Thelypteris mercurii* (A. Braun ex Hieron.) C.F. Reed, Phytologia 17: 292. 1968.—Type. COLOMBIA, **Magdalena**: Santa Marta, near Minca, *Stübel 363* (lectotype designated here: B [digital photo!]).

Thelypteris randallii Maxon & Morton ex Morton, Amer. Fern J. 53: 69. 1963.—Type. JAMAICA, **St. Thomas**: From a ravine above House Hill, *Maxon 9068* (holotype: US!; isotypes: US!, GH!).

Thelypteris trelawniensis Proctor, Amer. Fern J. 71: 58. 1981.—Type. JAMAICA, **Trelawny**: 1 mile N of Spring Garden, *Proctor 37704* (holotype: IJ!).

DISTRIBUTION.—Continental tropical America from southwestern Mexico to Panama, Colombia, Ecuador (including Galapagos Islands), Peru, and the Caribbean (Greater Antilles: Cuba, Hispaniola, Jamaica, and Puerto Rico; Lesser Antilles: St. Kitts, Martinique, St. Lucia, St. Vincent, and Grenada).

46. *Amauropelta opposita* (Vahl) Pic. Serm., Webbia 31: 251. 1977. *Polypodium oppositum* Vahl, Eclog. Amer. 3: 53. 1807. *Aspidium oppositum* (Vahl) Sw., Adnot. Bot. 67. 1829; *non* Kaulf. 1903. *Nephrodium oppositum* (Vahl) Diels, Nat. Pflanzenfam. [Engler & Prantl] 1, Abt. 4: 172. 1899; *non* Hook 1862. *Dryopteris opposita* (Vahl) Urb., Symb. Antill. (Urban). 4: 14. 1903; *non* Kuntze 1891. *Thelypteris opposita* (Vahl) Ching, Bull. Fan Mem. Inst. Biol. Bot. 10: 251. 1941. *Lastrea opposita* (Vahl) Gilli, Feddes Repert. 88: 393. 1977.—Type. MONTSERRAT, *Ryan s.n.* (holotype:?; isotype: BM [photo deposited at US!]).

Aspidium conterminum Willd., Sp. Pl., ed. 4 [Willdenow] 5: 249. 1810. *Nephrodium conterminum* (Willd.) Desvaux, Mém. Soc. Linn. Paris 6: 255. 1827. *Lastrea contermina* (Willd.) C. Presl, Tent. Pterid. 75. 1836. *Dryopteris contermina* (Willd.) Kuntze, Revis. Gen. Pl. 2: 812. 1891. *Thelypteris contermina* (Willd.) C.F. Reed, Phytologia 17: 269. 1968.—Type. MARTINIQUE: Plumier, Traité Foug. Amér., 36, *t. 47*. 1705!.

Aspidium polyphyllum Kaulf., Flora 6: 362. 1823.—Type. MARTINIQUE: "Flor. Martin.", Herbarium G. Mettenius, *Sieber 241* (holotype: B [digital photo!]; isotype: L ? [photo deposited at US!]).

Aspidium coarctatum Kunze, Bot. Zeitung (Berlin) 3: 287. 1845. *Polypodium coarctatum* (Kunze) Klotzsch, Linnaea 20: 382. 1847. *Lastrea coarctata* (Kunze) T. Moore, Index Fil. (T. Moore) 88. 1858. *Nephrodium coarctatum* (Kunze) Hieron., Bot. Jahrb. Syst. 34: 444. 1904. *Dryopteris coarctata* (Kunze) C.Chr., Index Filic. 258. 1905. *Thelypteris coarctata* (Kunze) R.M. Tryon, Rhodora 69: 5. 1967.—Type. VENEZUELA, **Distrito Capital**: Caracas, *Moritz 77* (holotype: B [photo deposited at GH!]; isotype: BM).

Phegopteris delicatula Fée, Mém. Foug., 11. Hist. Foug. Antil. 51, *t.* 20, *f.* 1. 1866. *Dryopteris delicatula* (Fée) C.Chr., Kongel. Danske Vidensk. Selsk. Skr., Naturvidensk. Math. Afd., ser. 7, 4: 294. 1907. *Thelypteris delicatula* (Fée) Proctor, Rhodora 61: 306. 1959 [1960].—Type. GUADELOUPE: 1864, *L'Herminier s.n.* (holotype: ?, not found at P).

Aspidium pachychlamis Fée, Mém. Foug., 11. Hist. Foug. Antil. 77, *t. 21, f. 2.* 1866.––Type. GUADELOUPE: 1961, *L'Herminier s.n.* (holotype: ?, not found at P).

Aspidium strigosum Fée, Mém. Foug., 11. Hist. Foug. Antil. 78, *t. 22, f. 2.* 1866. *nom. illeg.*—Type. GUADELOUPE: 1863, *L'Herminier s.n.* (holotype: ?, not found at P; isotype: BM [photos deposited at GH! and US!]).

DISTRIBUTION.—Continental tropical America from Costa Rica to Venezuela, Trinidad and Tobago, Ecuador to Bolivia, southern Brazil, and the Caribbean (Greater Antilles: Puerto Rico; Lesser Antilles: Saba, St. Kitts, Montserrat, Guadeloupe, Dominica, Martinique, St. Lucia, St. Vincent, and Grenada).

47. *Amauropelta resinifera* (Desv.) Pic. Serm., Webbia 31: 251. 1977. *Polypodium resiniferum* Desv., Mag. Neuesten Entdeck. Gesammten Naturk. Ges. Naturf. Freunde Berlin 5: 317. 1811. *Dryopteris resinifera* (Desv.) Weath., Contr. Gray Herb. 114: 32. 1936. *Lastrea resinifera* (Desv.) Copel., Gen. Fil. (Ann. Cryptog. Phytopathol. 5) 140. 1947. *Thelypteris resinifera* (Desv.) Proctor, Bull. Inst. Jamaica, Sci. Ser. 5: 63. 1953.—Type. NEOTROPICS: From "America calidiore", Ex herb. Desvaux, *Anon.* (holotype: ?, not found at P [photo deposited at US!]).

Nephrodium panamense C. Presl, Reliq. Haenk. 1: 35. 1825. *Lastrea panamensis* (C. Presl) C. Presl, Tent. Pterid. 76. 1836. *Dryopteris panamensis* (C. Presl) C.Chr., Kongel. Danske Vidensk. Selsk. Skr., Naturvidensk. Math. Afd., ser. 7, 4: 292. 1907. *Thelypteris panamensis* (C. Presl) E.P. St. John, Amer. Fern J. 26: 44. 1936.—Type. PANAMA: *Haenke s.n.* (holotype: PR or PRC ?; isotype: B [digital photo!]; possible isotype: K)

Nephrodium caribaeum Jenman, J. Bot. 24: 270. 1886. *Dryopteris caribaea* (Jenman) C.Chr., Index Filic. 257. 1905. *Thelypteris caribaea* (Jenman) C.V. Morton, Amer. Fern J. 53: 65. 1963. *Thelypteris resinifera* var. *caribaea* (Jenman) Proctor, Amer. Fern J. 71: 60. 1981.—Type. JAMAICA, **St. Ann**: From N slope of Mount Diablo, *Sherring s.n.* (holotype: K; isotypes: IJ, US!).

DISTRIBUTION.—Southern Florida (USA), continental tropical America from Mexico to Colombia, Ecuador, and the Caribbean (Greater Antilles: Cuba, Hispaniola, Jamaica, and Puerto Rico).

48. ***Amauropelta glutinosa*** (C.Chr.) O. Alvarez, this dissertation, Chapter 3: 37. 2010. *Dryopteris glutinosa* C.Chr., Kongl. Svenska Vetensk. Acad. Handl., ser. 3, 16: 18, *t. 3, f. 1-4*. 1937. *Thelypteris glutinosa* (C.Chr.) C.V. Morton, Amer. Fern J. 53: 66. 1963.—Type. HAITI, **Sud**: Massif de la Hotte, western group, Torbec, top of Morne Formon, *Ekman H7500* (holotype: S; isotype: US!).

DISTRIBUTION.—Endemic to the Caribbean (Greater Antilles: Hispaniola).

X. Section **Pachyrachis**

Amauropelta sect. ***Pachyrachis*** (A.R. Sm.) O. Alvarez, **comb. nov.** *Thelypteris* subg. *Amauropelta* sect. *Pachyrachis* A.R. Sm., Amer. Fern J. 64: 92. 1974.—Type: *Aspidium pachyrachis* Kunze ex Mett. [≡ *Amauropelta pachyrachis* (Kunze ex Mett.) O. Alvarez].

Rhizomes erect. *Petiole* bases, and sometimes entire croziers, coated with mucilage, or else mucilage absent. *Laminae* abruptly to gradually reduced proximally, with few to many pairs of reduced proximal pinnae; *laminar tissue* glabrescent abaxially, with sessile globular glands or eglandular; *rachises* and *costae* abaxially glabrescent, pubescent only at margins of adaxial sulci, eglandular; *hairs* on rachises, costae and laminar tissue not fasciculate, when present, always acicular; costal *scales* abaxially absent. *Aerophores* at pinna bases present, absent at costular bases. *Sori* medial to submarginal; *indusia* obvious, large, glabrous; *sporangia* glabrous.

Around ten species (Smith 1974), two of them occur in the Caribbean.

49. *Amauropelta malangae* (C.Chr.) O. Alvarez, this dissertation, Chapter 3: 40. 2010.

Dryopteris malangae C.Chr., Kongl. Svenska Vetensk. Acad. Handl., ser. 3, 16: 21, *t. 6, f. 6-8.* 1937. *Thelypteris malangae* (C.Chr.) C.V. Morton, Amer. Fern J. 53: 66. 1963.—Type. HAITI, **Sud-Est**: Massif de la Selle, Grand Crête-a-Piquants, Port au Prince, Morne Malanga, *Ekman H5889* (holotype: S; isotypes: BM, US!).

Nephrodium jenmanii var. *sitiorum* Jenman, J. Bot. 17: 261. 1879. *Thelypteris malangae* var. *sitiorum* (Jenman) Proctor, Amer. Fern J. 71: 60. 1981.—Type. JAMAICA, **St. Andrew and Portland**: Moody's Gap, *Jenman 38* (holotype: K [photo deposited at US!]; isotype: US!).

Dryopteris consanguinea var. *aequalis* C.Chr., Smithsonian Misc. Collect. 52: 380. 1909.—Type. JAMAICA, **St. Andrew**: Second Breakfast spring, near Tweedside, *Maxon 997* (holotype: US! [fragment at NY]).

DISTRIBUTION.—Endemic to the Caribbean (Greater Antilles: Cuba, Hispaniola, and Jamaica).

50. ***Amauropelta pachyrachis*** (Kunze ex Mett.) O. Alvarez, this dissertation, Chapter 3: 41. 2010. *Aspidium pachyrachis* Kunze ex Mett., Abh. Senckenberg. Naturf. Ges. 2: 367. 1858. *Lastrea pachyrachis* (Kunze ex Mett.) T. Moore, Index Fil. (T. Moore) 99. 1858. *Nephrodium pachyrachis* (Kunze ex Mett.) Hook., Sp. Fil. 4: 100. 1862. *Dryopteris pachyrachis* (Kunze ex Mett.) Kuntze, Revis. Gen. Pl. 2: 813. 1891. *Thelypteris pachyrachis* (Kunze ex Mett.) Ching, Bull. Fan Mem. Inst. Biol. Bot. 10: 253. 1941.—Type. VENEZUELA, **Mérida**: Merida, *Moritz 409* (holotype: B [digital photo!]; isotype: BM ?).

Nephrodium jenmanii Baker ex Jenman, J. Bot. 15: 263. 1877. *Dryopteris jenmanii* (Baker ex Jenman) C.Chr., Index Filic. 272. 1905. *Dryopteris pachyrachis* var. *jenmanii* (Baker ex Jenman) C.Chr., Kongel. Danske Vidensk. Selsk. Skr., Naturvidensk. Math. Afd., ser. 7, 10: 140. 1913. *Thelypteris pachyrhachis* var. *jenmanii* (Baker ex Jenman) Proctor, Bull. Inst. Jamaica, Sci. Ser. 5: 63. 1953.—Type. JAMAICA, **Portland**: "From either the vicinity of Cinchona or Portland Gap" (Proctor 1985: 316), *Jenman 51* (holotype: K).

Dryopteris germaniana var. *glandulosa* C.Chr., Kongel. Danske Vidensk. Selsk. Skr., Naturvidensk. Math. Afd., ser. 7, 4: 311. 1907.—Type. JAMAICA, **Portland**: At the summit of Blue Mountain Peak, *Maxon 1404* (lectotype chosen by Proctor, 1985: 316: BM; isolectotype: US!).

Dryopteris jenmanii var. *vincentis* Domin, Rozpr. Kral. Ceske Spolecn. Nauk, Tr. Mat.-Prir., n.s. 2: 208, *t. 35, f. 1*. 1929.—Type. SAINT VINCENT: From St. Vincent, *Smith & Smith 855* (holotype: ?; isotypes: BM, GH!, IJ!, US!).

DISTRIBUTION.—Continental tropical America from Guatemala to Venezuela, Ecuador to Bolivia, southern Brazil, and the Caribbean (Greater Antilles: Cuba, Hispaniola, and Puerto Rico; Lesser Antilles: St. Vincent [Proctor 1977]).

THE SYSTEMATICS OF THE GENUS *AMAUROPELTA* (PTERIDOPHYTA: THELYPTERIDACEAE) IN THE CARIBBEAN ISLANDS

VOLUME II

By

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CHAPTER 5

SYSTEMATICS OF *AMAUROPELTA* SECT. *UNCINELLA* (THELYPTERIDACEAE) IN THE CARIBBEAN ISLANDS

ABSTRACT

In this revision 15 taxa (14 species and one variety) of *Amauropelta* sect. *Uncinella* are recognized in the Caribbean area. Species in sect. *Uncinella* are clearly diagnosable by their uncinate or hamate hairs in laminar tissue and/or vascular axes. The revision is based mainly on herbarium studies and field observations. The taxonomic treatment includes descriptions, keys, and illustrations. This regional revision documents the current diversity of the Caribbean species of *Amauropelta* sect. *Uncinella*. In this study, *A. consimilis* was excluded from the synonymy of *A. gracilis* and revalidated as a good taxon; *A. oligocarpa* var. *navarrensis* is recognized at the varietal rank. In addition, the taxonomic confusion that persisted about the specific epithet *diplazioides* was resolved.

INTRODUCTION

Amauropelta Kunze, often treated as *Thelypteris* subg. *Amauropelta* (Kunze) A.R. Sm., is a genus of at least 200 species. The genus has its center of diversity in the Neotropics with some species widely distributed in tropical America (Holttum 1971, 1977; Smith 1973, 1974, 1990, 1992; Proctor 1985a, 1989; Ponce 1987). In addition, there are about eight species described from Africa, Madagascar, and the Mascarene Islands, and three other species are endemic to the Pacific Islands of Hawaii, Tahiti, and Rapa (Holttum 1977).

The species of *Amauropelta* can be characterized by their pinnate to pinnate-pinnatifid leaves with reduced proximal pinnae; typically simple veins with the lowermost meeting the segment margins always distal to the sinuses; sori usually indusiate; and a base chromosome number (*x*) of 29 (Smith 1971a, 1990, 1992). The species also show remarkable diversity in hair morphology (see Smith 1974). *Amauropelta* has been subdivided into 10 sections (nine sections by Smith [1974] and one section by Alvarez-Fuentes [this dissertation, Chapter 4]), based on hair types, presence of costal scales, gland type and distribution, and position of veins relative to adaxial side of the laminae.

Amauropelta sect. *Uncinella* (A.R. Sm.) J.P. Roux is clearly diagnosable by its uncinate or hamate hairs in laminar tissue and/or vascular axes. This group comprises around 50 species in the Neotropics, and two African species, *A. bergiana* (Schltdl.) Holttum, which is widespread on the African continent and adjacent islands, and *A. membranifera* (C.Chr.) Holttum from Madagascar (Holttum 1971; Moran & Smith 2001). The group addressed here, the Caribbean species of *Amauropelta* sect. *Uncinella*, is especially interesting because the observed level of endemism is strikingly similar to the degree of endemism found for several flowering plant families in the Caribbean flora (Samek 1973; Borhidi & Muñiz 1986; Borhidi 1996; Santiago-Valentin & Olmstead 2004). Fourteen species of this group occur in the Caribbean Islands, eight of which are endemic to one or few islands; representing 57% endemism, paralleling that of the Caribbean flora in general (Santiago-Valentin & Olmstead 2004; Francisco-Ortega & al. 2007).

The most comprehensive treatments for *Amauropelta* covering the Caribbean region are those of Christensen (1907, 1913, 1920) for *Dryopteris* subg. *Lastrea* (Bory) C.Chr.; since then, the study of the genus has benefited greatly from the contributions of Holttum (1971, 1974, 1977, 1982) for the revision of paleotropical amauropeltoid species; Smith (1973, 1974, 1981a, 1981b, 1988, 1992) for his multiple contributions to continental American fern floras; Proctor (1977, 1985a, and 1989) for his Caribbean floristic treatments covering the Lesser Antilles, Jamaica, and Puerto Rico and the Virgin Islands; Ponce (1987) for her monograph of Argentinean thelypteroids; and more recently, the contributions of Sánchez & al. (2006) in the new Flora of the Republic of Cuba. The biggest gap in our knowledge of *Amauropelta* in the Caribbean was in the island of Hispaniola, where only two outdated checklists exist: one made by Urban (1925), and the other by Christensen (1937), the latter based on the collections of Erick Ekman deposited in the herbaria of Stockholm (S) and the U.S. National Herbarium (US).

This regional monograph documents the current diversity of the Caribbean species of *Amauropelta* sect. *Uncinella*. Unfortunately, the destruction of mountain forests, in which these species occur, has continued in the area and is occurring at a fast pace. This is especially true in Haiti where more than 95% of the forest coverage is gone (Coupeau 2008). Additionally, many species are very local in their distribution, and many may soon be extinct.

TAXONOMIC HISTORY

Smith (1974) first proposed section *Uncinella* to place together those thelypteroid species characterized by the presence of uncinate hairs on laminar tissue and/or axes. Before 1974, these species were described under *Dryopteris* Adanson by Christensen (1907, 1913, 1920) and included in his group "*opposita*" or *Dryopteris* subg. *Lastrea* (Bory) C.Chr.

The monumental work of Christensen (1907, 1913, 1920) constituted the starting point in the modern taxonomy of Thelypteridaceae. He recognized ten subgenera within *Dryopteris* and made clear distinctions between those he considered true dryopteroid ferns (*Ctenitis*, *Eudryopteris*, and *Stigmatopteris*) and those he considered thelypteroid ferns. The differences between true dryopteroid and thelypteroid ferns have been extensively discussed elsewhere, e.g., Morton (1963), Holttum (1969), and Smith (1971b, 1973). Among the thelypteroid ferns, Christensen established subgenus *Lastrea*, which included all the species with free veins and pinnate-pinnatifid lamina attenuated at the bases. Some of the species with uncinate hairs that Christensen included in subg. *Lastrea* are also included in the present study.

Smith (1973) established *Thelypteris* subg. *Amauropelta* (Kunze) A.R. Sm., to accommodate those species of Christensen's "*opposita*" group under a new subgeneric name because the name *Lastrea* was superfluous at subgeneric rank. Subsequently, he subdivided the subg. *Amauropelta* into nine sections (Smith 1974): *Adenophyllum*, *Amauropelta*, *Apelta*, *Blennocaulon*, *Blepharitheca*, *Lepidoneuron*, *Pachyrachis*, *Phacelothrix*, and *Uncinella*.

The Neotropical species of section *Uncinella* have been historically treated under *Thelypteris* (see Smith 1981a [Guatemala], 1981b [Chiapas, Mexico], 1988 [Oaxaca, Mexico], Smith 1992 [Peru], 1993b [Guianas]; Proctor 1977 [Lesser Antilles], 1985a [Jamaica], 1989 [Puerto Rico and the Virgin Islands]; Ponce 1987 [Argentina]; Pérez-García & al. 1999 [El Bajío, Mexico]; Mickel & Smith 2004 [Mexico]; Sánchez & al. 2006 [Cuba]); however, the only two paleotropical species with uncinate hairs have been treated under genus *Amauropelta* (see Holttum 1974 [Africa and adjacent islands]; Roux 2001 [South Africa]; Chaerle & Viane 2002 [Ethiopia]). The new combination for sect. *Uncinella* under *Amauropelta* was made by Roux (2001) and, up to now, has only been used in treatments of Old World species.

This duality in classification represents a flaw in the taxonomy of sect. *Uncinella*, and is pervasive at the family level where there are still two divergent taxonomic points of view regarding the number of genera that should be recognized within the family. These two major taxonomic systems and their history can be traced back to 1936, where the use of genus *Thelypteris* Schmidels was revitalized by Ching, who later established family Thelypteridaceae (Ching 1940; Holttum 1969). Unfortunately, the name of the family was not validly published at the time and corrections were made later by Pichi Sermolli (1970). Ching (1940) subdivided Thelypteridaceae into 12 genera within three tribes. This scheme of classification, which included multiple genera within Thelypteridaceae, has been adopted by most pteridologists working with Old World species. Many of them even proposed their own classification systems by modifying the number of genera presented by Ching (Copeland 1947; Ching 1963; Holttum 1969, 1971, 1973; Pichi Sermolli 1970).

On the other extreme, Morton (1963) placed all of the thelypteroid ferns into the single genus *Thelypteris*. His work was shortly followed by Reed (1968), who made a large number of new combinations to include many other species in this broadly constructed concept of *Thelypteris*. This approach has been adopted mainly by New World pteridologists, with very few modifications such as the recognition of two to three genera by Proctor (1985a, 1989), Smith (1993a), Ponce (1987), and Sánchez & al. (2006).

These two classification systems for Thelypteridaceae have largely coexisted causing few conflicts, mainly because only a few Old World species have close relatives in the New World and vice versa (Holttum 1971). However, the recent incorporation of molecular data and modern concepts of monophyly in the analysis of genera and species within Thelypteridaceae (Hasebe & al. 1995; Smith & Cranfill 2002; Schuettpelz & Pryer 2007; Alvarez-Fuentes [this dissertation, Chapter 2]) have provided new insights that further our current understanding of the family and contribute to the founding of a comprehensive taxonomy for the group (this dissertation, Chapter 2).

In this revision I am proposing the treatment of the Neotropical thelypteroid species with uncinate hairs under *Amauropelta* sect. *Uncinella*. *Amauropelta* was established by Kunze in 1843 based on his Lesser Antillean *A. breutelii* [= *Amauropelta limbata* (Sw.) Pic. Serm.]; ironically, there is no floristic treatment in the New World that recognizes *Amauropelta* at the generic level. Wood (1973) suggested a formal revival of genus *Amauropelta* based on his palynological study of many Neotropical species from Christensen's "*opposita*" group (*Dryopteris* subg. *Lastrea*) but he was not followed. In addition to *Dryopteris*, *Thelypteris*, or *Amauropelta* some other generic names previously applied to thelypteroid ferns with uncinate hairs are *Aspidium*, *Grammitis*, *Nephrodium*, *Phegopteris*, and *Polypodium*, among others.

MATERIALS AND METHODS

General morphology. During this study ca. 500 specimens were examined from those herbaria listed in the Acknowledgments. Herbarium abbreviations follow Holmgren & al. (1990; http://sweetgum.nybg.org/ih/). Several type specimens were examined in the form of digital images from the Virtual Herbarium of B ([5] Röpert 2000), or kindly provided by the curators of P (14). All pteridological terms were standardized following Lellinger (2002). Field observations were made in Jamaica (August 2003), Cuba (1997, May 2008), and Hispaniola (May-June 2008). I made an additional 68 collections (~145 specimens) representing four species of *Amauropelta* sect. *Uncinella*. Duplicates are deposited in five herbaria (IJ, JBSD, MSC, QCNE, and UC).

One hundred and fifty-seven different characters (137 qualitative and 34 quantitative) were measured or observed for each species (Appendix C, Tables 3, 4). Measurements of 14 of the 34 quantitative characters (Appendix C, Table 4) were taken from digital images of herbarium specimens using the software tpsDIG2 ver. 2.12 (http://life.bio.sunysb.edu/morph/). These images were taken by placing the specimens on a copy stand with an attached Canon EOS digital Rebel XT camera with image-recording quality of 3456 x 2304 pixels. Other microscopic morphological measurements were taken directly from dried material using a graduated ocular micrometer scaled by using a slide micrometer. Data from herbarium specimen labels, such as rhizome types and plant height, were also collected and used. Overall, the 171 characters were used to effectively characterize and compare each taxon, and to complete the taxonomic keys and species descriptions.

Micromorphology (SEM). Sporangia, spores, indusia, glands, and hairs of select species were observed by scanning electron microscopy (SEM). Sporangia and spores were obtained from dried pinnae and attached, without pre-treatment, to stubs with double-sided carbon tape, coated under vacuum with gold-palladium for 4 minutes at 20 mA, and examined and photographed at 12 kV using a JEOL 6400 V SEM at the Center for Advanced Microscopy at Michigan State University. Vouchers are cited in figures.

Taxonomy. For each Caribbean species of *Amauropelta*, the homotypic and heterotypic synonyms that are relevant to the Caribbean area are included. Synonymy is based mainly on study of types and, where necessary, the list was complemented from various sources including literature, and the online databases TROPICOS (2008; http://www.tropicos.org) and the International Plant Names Index (IPNI, 2008; http://www.ipni.org). Authors and protologue abbreviations were standardized following the online database IPNI (Appendix D).

MORPHOLOGY

Habit. Species of *Amauropelta* sect. *Uncinella* are perennial, erect and herbaceous ferns. The plants are mainly terrestrial, but some species can grow so near to water that their rhizomes remain under water for long periods of flood.

Rhizomes. In general, most common rhizome types are suberect or erect, with leaves growing in more or less tight fascicles; in some species (*A. germaniana*, *A. heteroclita*, *A. hydrophila*, and *A. intromissa*) the rhizomes are short-creeping, with leaves also growing in fascicles at rhizome apices. In others, the rhizomes are exceptionally long-creeping, as in *A. consimilis* and *A. rustica*, with leaves growing in fascicles or separate at a short distance from each other. Typically, rhizome apices are more or less covered by scales that protect the young leaves. The root system is very dense along the rhizomes.

Leaves. The leaves of *Amauropelta* sect. *Uncinella* are monomorphic, pinnate-pinnatifid with distal pinnae fused into a pinnatifid apex, which can be short-acuminate to long-attenuate, and abruptly to gradually reduce proximally.

Petioles and rachises. Together, petioles and rachises constitute the main axis of the leaf and are adaxially sulcate; the sulci do not connect costae and rachises as in species from other fern families, such as Aspleniaceae. Another important characteristic is the presence of two hypocampiform, concentric and periphloematic vascular bundles at the petiole bases (Figure 2A). Each trace is formed by a group of central tracheids connected to each other and surrounded by phloem. The tracheids are circular to polyhedral-isodiametric, with the largest ones in the medial zone. The two traces fuse distally into a single U-shaped strand (Figure 2C).

Laminae. Several Caribbean species of sect. *Uncinella* have thin and herbaceous laminae: exceptions are *A. rupestris*, *A. linkiana*, *A. heteroclita*, *A. inabonensis*, *A. rustica*, and *A. antillana*, which are thick and coriaceous.

The number and shape of the reduced proximal pinnae are also important characters to take into consideration, e.g., *A. negligens* and *A. hydrophila* have up to 3 pairs, while *A. germaniana* and *A. scalaris* can have as many as 14 pairs. The reduced proximal pinnae are somewhat deltate-pinnatifid in most Caribbean taxa of sect. *Uncinella*. The variability is more noticeable at the lowermost pinnae, where, in some species, they are deltate-pinnatifid (e.g., *A. gracilis*), or deltate and variously dissected with enlarge basal segments (e.g., *A. germaniana*), or a large lobe (e.g. *A. oligocarpa*), or are auriculiform (e.g., *A. scalaris*).

The laminar texture and the presence of reduced proximal pinnae have been extensively used in delimiting large groups in *Amauropelta* (Christensen 1907, 1913; Smith 1974) due to their variability within and between sections.

Pinnae. Pinnae symmetry for most Caribbean *Uncinella* species is equilateral; however, *A. negligens* and *A. antillana* have somewhat inequilateral pinnae, with the acroscopic sides larger than the basiscopic ones.

Differences in size and shape of the basal segments, relative to the remaining segments in the same pinnae, are also useful in differentiating species in this group; relatively smaller basal segments occur in *A. rupestris*, *A. consimilis*, *A. heteroclita*, and *A. rustica.* Elongate basal segments are found in *A. linkiana*, *A. gracilis*, *A. oligocarpa*, *A. intromissa*, *A. negligens*, *A. germaniana*, *A. inabonensis*, *A. antillana*, and *A. scalaris*; while basal segments the same size as the rest occr in *A. rupestris* and *A. hydrophila.*

The presence of proliferous bulbils on acroscopic axils on adaxial side of distal pinnae (Figure 20A, B) is diagnostic for *A. rupestris*, *A. linkiana*, and *A. germaniana*; the remainder species of the genus in the Caribbean islands lack such bulbils. These proliferous bulbils remain undeveloped while attached to the plant; however, small plantlets have been seen in specimens of *A. rupestris* from Colombia, and in *A. germaniana* from the Lesser Antilles.

Aerophores. This term refers to epidermal projections that have some aerating function in young undeveloped laminae (Smith 1974). Aerophores appear in the abaxial junctures of pinnae and rachises. They are dark in adult laminae, sometimes vestigial, and their presence or absence is useful in characterizing species in this group. Their presences in some species have been overlooked due to their small size (as in *A. intromissa*). However, in others (*A. germaniana*, *A. rustica* and *A. hydrophila*) the aerophores are obvious and elongate, up to 2 mm, and deltate (Figure 20C, D). Aerophores are absent in *A. rupestris*, *A. consimilis*, *A. oligocarpa*, and *A. scalaris.*

Vestiture. The characteristics of hairs, scales and glands in rhizomes and leaves have been historically used as reliable characters to discriminate species in this group; in view of this I prefer to discuss the distinctiveness of each character separately, below.

Hairs. All species of section *Uncinella* have uncinate (or hamate) hairs in some part of the leaves; this type of hair is more obvious on the abaxial side of the lamina on laminar tissue, indusia, rachises, costae, costules, and veins. In the case of the Caribbean species the variability of hair types (e.g., acicular, uncinate, ciliform, septate) and size, as well as hair distribution on laminar tissue and axes is greatest in *A. oligocarpa*, where uncinate, long and short acicular, ciliform, and septate hairs coexist (Figure 21). In most species of the Caribbean group, the adaxial side of laminae is finely strigulose, with short acicular hairs fully appressed. In addition, *A. oligocarpa* has robust and longer hairs interspersed on both sides of costae, midveins, and veins; moreover, the presence of long, variously septate hairs has been used to separate the varieties *oligocarpa* and *navarrensis* in *A. oligocarpa*. *Amauropelta rupestris*, on the other hand, has rachises finely strigulose, with short-acicular hairs fully appressed and directed proximally (Figure 21E); this character is unique among the Caribbean species of the genus. Long uncinate hairs, 0.5-1 mm long, on the abaxial side of rachises and costae are unique to *A. rustica* from the Lesser Antilles.

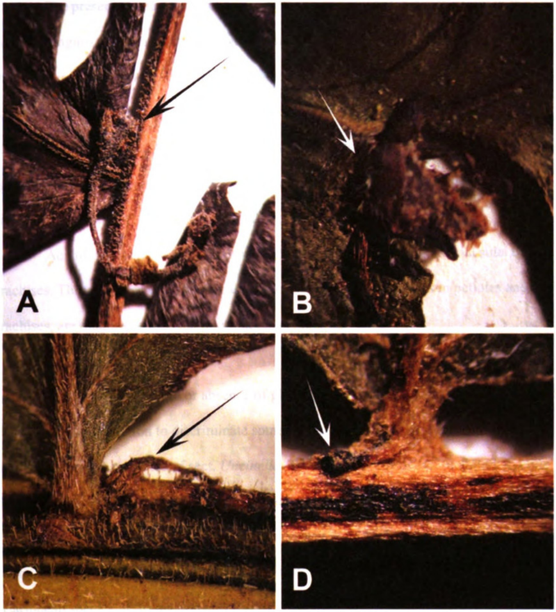


Figure 20. A, B. Proliferous bulbils (indicated by arrows). A. *Amauropelta linkiana* (*Questel 2876*). B. *A. rupestris* (*Holdridge 1984*). C, D. Aerophores (indicated by arrows). C. *A. germaniana* (*Lellinger 440*). D. *A. linkiana* (*Ekman H12935*).

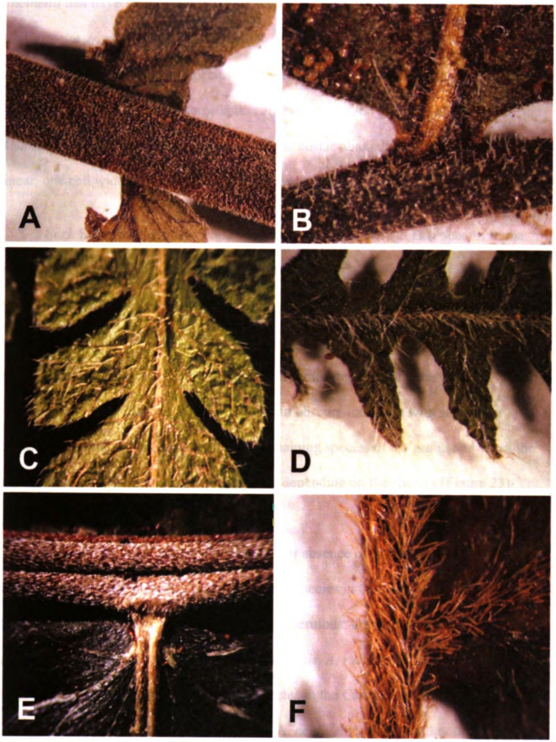
The presence of hairs in proliferous bulbils and aerophores is also useful in the species diagnoses. As mentioned above, proliferous bulbils covered by scales but lacking hairs occur in *A. rupestris*. Proliferous bulbils on *A. linkiana* and *A. germaniana* are covered by uncinate hairs. For those Caribbean species of sect. *Uncinella* that have aerophores (*A. linkiana*, *A. gracilis*, *A. heteroclita*, *A. intromissa*, *A. negligens*, *A. germaniana*, *A. inabonensis*, *A. rustica*, *A. hydrophila*, and *A. antillana*) they are glabrous in *A. negligens* and *A. hydrophila*, and pubescent in the remaining species.

Acicular unicellular hairs are always present at least along the adaxial sulci of rachises. This, together with the characteristics of the vascular bundles in petioles and rachises, are diagnostic for Thelypteridaceae (Figure 2).

Glands. The presence or absence of glands in the laminar tissue, axes, and indusia is another good criterion to discriminate some species, especially because its presence is somewhat rare in members of sect. *Uncinella*. Two types of glands can be found: hyaline short-stipitate (or hyaline capitate hairs) in petioles and rachises of *A. oligocarpa*, and sessile, globular, yellowish to reddish glands present in adaxial laminar tissue of *A. oligocarpa*, *A. consimilis*, and *A. gracilis*. Glands are otherwise absent among the Caribbean species of the section.

Scales. A scale is a small, multicellular and flat epidermal outgrown that usually covers new leaves. Features such as size, shape, pubescence, and color of the scales at rhizome apices and petiolar bases often provide good characters to separate species. *Amauropelta rustica* and *A. inabonensis* are the only two Caribbean species of sect.

Figure 21. Variability in pubescence of *Amauropelta* sect. *Uncinella*. A, B. Hairs at portion of proximal rachises (abaxial side). A. *Amauropelta consimilis* (*Proctor 20328*). B. *A. gracilis* (*Maxon & Killip 220*). C, D. Hairs at adaxial side of medial pinnae. C. *A. oligocarpa* var. *oligocarpa* (*Alvarez-Fuentes & Clase 653*). D. *A. oligocarpa* var. *navarrensis* (*Estremera s.n.*, Oct. 1983). E, F. Hairs at medial portion of rachises (adaxial side). E. *A. rupestris* (*Mickel et al. 8919*). F. *A. hydrophila* (*Pére Duss 4037*).


A
B
C
D
E
F

Uncinella that have scales fully covering the main axis of leaves (Figure 22A-C). *Amauropelta gracilis*, *A. heteroclita*, and *A. antillana* have long, golden brown, lustrous scales, whereas the rest of the species in the group have light brown or castaneous scales, that can be lustrous or not. In some species (*A. rupestris*, *A. inabonensis*, *A. rustica*, and *A. antillana*) it is common to see small scales at costae abaxially; these scales are usually linear, one cell wide, and no longer than 1.5 mm.

Sori. Sorus position and shape have been also used to segregate species in the group. Sorus position varies from pericostal to inframedial in *A. rustica*, medial in *A. hydrophila*, and from supramedial to submarginal in most species, including those with elongate sori along the veins. Sorus shape also varies greatly; for instance, *A. rupestris*, *A. linkiana*, and *A. heteroclita* have elongate exindusiate sori along the veins. *Amauropelta consimilis* and *A. gracilis* have an obscure indusium with somewhat elongate sori. Round sori are found in the remaining species of the group and when the sori are round can be indusiate or exindusiate depending on the species (Figure 23).

Indusia. As noted before, the presence or absence of indusia is also important in the distinction of the species (Figure 23). Some species in the group have obviously persistent, large, reniform indusia, variously puberulous; these species are: *A. germaniana* (Lesser Antilles group), *A. inabonensis*, *A. rustica*, *A. hydrophila*, *A. antillana*, and *A. scalaris*. The remaining species in the Caribbean group are exindusiate (*A. rupestris*, *A. linkiana*, *A. heteroclita*, and A. *negligens*), or bear rather obscure and deciduous indusia, easily overlooked due to their small size (*A. consimilis*, *A. gracilis*, *A. oligocarpa*, and *A. intromissa*).

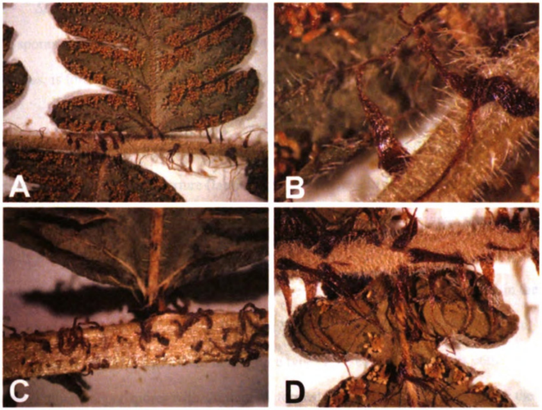


Figure 22. Scaly rachises on *Amauropelta* sect. *Uncinella*. A, B. *A. inabonensis* (*Axelrod & Chavez 4312*). C. *A. rustica* (*Webster 13361*). D. *A. funckii* (*Arauz et al. 530*).

Sporangia. Amauropelta species have pedunculate sporangia with vertical annuli. The sporangium is glabrous in the Caribbean species of sect. *Uncinella.* The stalk, also glabrous, is formed by three rows of rectangular cells with thick cellular walls.

Spores. Thelypteroid species have monolete spores that are bilaterally symmetrical with a linear aperture (laesura) ranging from $^1/_3$ to $^3/_4$ the spore length (Tryon & Lugardon 1991). They are reniform in lateral view. In polar view, spores are mostly ellipsoidal in shape and longer than broad (Figure 24).

Spores of seven species of *Amauropelta* sect. *Uncinella* have been covered in the palynological surveys of Wood (1973), Tryon & Tryon (1982), and Tryon & Lugardon (1991). Wood (1973) include them in his spore type "IIa", comprising spores with densely reticulate perispores with a reticulum formed by short pillars that rise above the spore surfaces (Figure 24).

CHROMOSOME NUMBER

Chromosome counts have been made before for several of the species covered in the present monograph (Smith 1971a; Löve & al. 1977). The species are: *A. rupestris* (as *A. diplazioides*), *A. heteroclita*, *A. linkiana*, *A. oligocarpa* var. *navarrensis* (as *A. navarrensis*), *A. oligocarpa* var. *oligocarpa*, *A. scalaris*, and the African *A. bergiana.* All of them share a base chromosome number $x = 29$, as reported for most species of genus *Amauropelta* (Smith 1971a; Löve & al. 1977).

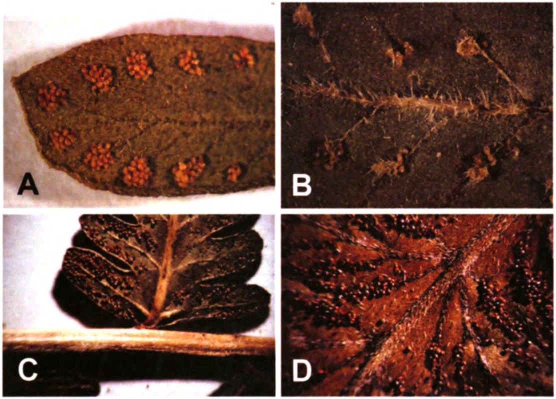


Figure 23. Sori and indusia of *Amauropelta* sect. *Uncinella*. A. Apical portion of segment (abaxial surface) of *A. consimilis* (*Hodge & Hodge 1764*) showing rounded sori and sessile yellowish glands. B. Round sori showing small indusial in *A. rustica* (*Proctor 20236*). C, D. Elongate sori on abaxial side of pinnae. C. *A. linkiana* (*Ekman H12935*). D. *A. rupestris* (*Mickel et al. 8073*).

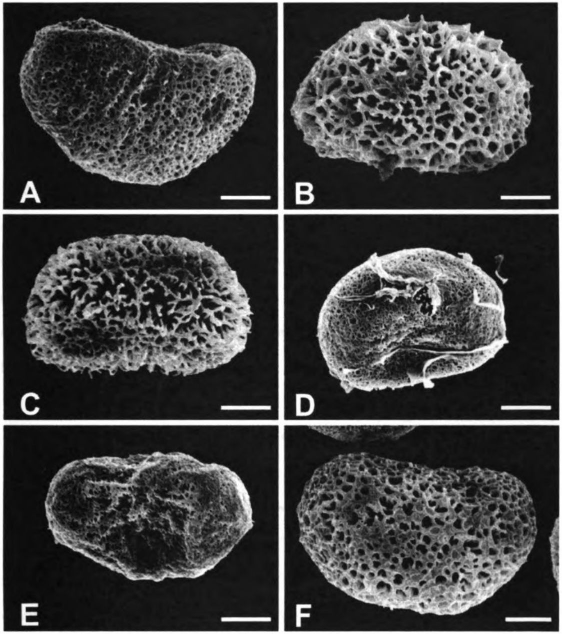


Figure 24. SEM images of spores of *Amauropelta* sect. *Uncinella*. A. *A. germaniana* (*Serguera 509*). B. *A. germaniana* (*Hodge 121*). C. *A. rustica* (*Webster 13361*). D. *A. scalaris* (*Mickel 1054*). E. *A. hydrophila* (*Questel 1034*). F. *A. inabonensis* (*Axelrod & Chavez 4312*). Scale: bar = 10 μm.

HYBRIDIZATION

Hybridization has probably played some role in the speciation of family Thelypteridaceae. The species not only hybridize occasionally with close relatives, but with members of other sections and subgenera as well (Holttum 1969, 1971, 1982; Smith 1990; Sánchez & al. 2006; Caluff pers. comm.). Hybrid specimens are cited in the discussion of the parental species and they are as follows: In Colombia, *A. rupestris* x unknown Colombian parent; in Jamaica, *A. heteroclita* x *A. gracilis*, *A. heteroclita* x *A. germaniana*, *A. oligocarpa* var. *oligocarpa* x *A. negligens*, and also *A. heteroclita* x *A. firma*, the latter from sect. *Scalpturata*. The latter hybrid only occurs near the Blue Mountain peak.

SPECIES CONCEPTS

Species delimitations within the Caribbean individuals and populations of *Amauropelta* sect. *Uncinella* have been based on the typological or morphological species concept, e.g., each species is morphologically distinguishable from its closest relatives by consistent morphological gaps (Brown and Lomolino 1998; Judd 2007). This approach has been historically used to circumscribe thelypteroid ferns, and its application assumes that morphological differentiation is the result of the speciation process. In this view, particular similarities in morphology (e.g., shared derived characters) can be useful to infer relationships among lineages (Haufler 1996). Although morphological species sometimes do not reflect the reality of biological interactions among sets of populations or individuals (Haufler 1996; Futuyma 1998), its application, in this study, had practical consequences because it was not possible to sample a large number of populations to assess adequately a species delimitation based on any other species concept, e.g., the biological species concept, which delimited species based on the amount of gene flow, exchanged via interbreeding, among individuals from a population, or group of populations, that do not interbreed with other such populations because of the existence of reproductive isolating mechanisms between them (Dobzhansky 1937; Futuyma 1998; Mayr 1942).

ECOLOGY

Species of *Amauropelta* sect. *Uncinella* that occur in the Caribbean Islands are mainly terrestrial ferns that grow mostly at middle- to high-elevation habitats, from 500 to 2250 m. Only one species, *A. consimilis* from the Lesser Antilles, is found near sea level. The montane species are more common at the edges of forests and moist trail banks growing partially exposed to various sunlight conditions. Some species (*A. oligocarpa* and *A. germaniana*) also grow in the closed, moist understory of wet montane forests or in the more open and dryer understory of coffee plantations or pine forests. Several species also occur along water courses or wet roadside embankments. Species occur in a large variety of soil types, from basic soils, like those associated with limestone outcrops, to extremely acid soils like those developed in Cuban "pinares" and those found in the high-elevation cloud forests of the Jamaican Blue Mountains.

TAXONOMY

Amauropelta Kunze, Farrnkräuter 1: 86. 1843. *Thelypteris* subg. *Amauropelta* (Kunze) A. R. Sm., Amer. Fern J. 63: 121. 1973.—Type: *Amauropelta breutelii* Kunze [≡ *Amauropelta limbata* (Sw.) Pic. Serm.]

Terrestrial. *Rhizomes* suberect to erect, sometimes long- or short-creeping, with more or less pubescent or glandular scales at the apices. *Leaves* monomorphic; *petioles*, *rachises*, and *costae* adaxially sulcate; *laminae* pinnate to usually pinnate-pinnatifid, proximal pinnae usually reduced, sometimes nearly to rhizomes; *laminar tissue* glabrescent or commonly pubescent, hairs acicular (unicellular or multicellular), uncinate, or sometimes fasciculate but never forked or stellate. *Aerophores* present at pinna bases, or absent; *segments* with fewer than 23 pairs of veins; *veins* usually simple, occasionally furcate, lowermost usually meeting margins of segments always distal to the sinuses. *Sori* round or elliptical, occasionally somewhat elongate, mostly medial on veins; *indusia* often present, usually round or reniform; *spores* monolete, reniform, with sporoderm finely reticulate. *Base chromosome* number $x = 29$ (Smith 1981b, 1988).

Amauropelta sect. ***Uncinella*** (A.R. Sm.) J.P. Roux, Conspect. South. Afr. Pteridophyta 116. 2001. *Thelypteris* subg. *Amauropelta* sect. *Uncinella* A.R. Sm., Amer. Fern J. 64: 89. 1974.—Type: *Polypodium oligocarpum* Humb. & Bonpl. ex Willd. [≡ *Amauropelta oligocarpa* (Humb. & Bonpl. ex Willd.) Pic. Serm.]

Rhizomes erect or creeping. *Laminae* gradually to abruptly reduced proximally, mostly eglandular; *hairs* on rachises and costae not fasciculate, uncinate hairs always present at least in the abaxial side of petioles, rachises or costae, more or less evenly distributed; *laminar tissue* adaxially strigulose; *costal scales* abaxially mostly absent; *proliferous bulbils* at bases of some distal pinnae present or absent. *Aerophores* at pinna bases present or absent, always absent at costular bases. *Sori* mostly submarginal; *indusia* absent, or present and very small, sometimes deciduous.

Perhaps 50 species (Smith 1974); fourteen species occurring in the Caribbean.

Key to the Caribbean species of *Amauropelta* section *Uncinella* (including *A. rudis*).

1. Indusia absent, if present deciduous, small and obscure, a tuft of hairs or small, ear-like lobes 2
    2. Rachises bearing small proliferous bulbils at axils of some distal pinnae 3
        3. Petioles and rachises densely furnished with short acicular hairs fully appressed and directed proximally; costae abaxially with at least a few deciduous, clathrate scales at costular bases; aerophores at abaxial pinna bases absent ..... 1. *A. rupestris*
        3. Petioles and rachises pubescent but hairs neither appressed, nor directed proximally; costae abaxially lacking scales; aerophores at abaxial pinna bases present ..... 2. *A. linkiana*
    2. Rachises lacking proliferous bulbils at axils of pinnae 4
        4. Laminar tissue abaxially covered by both acicular and uncinate hairs; sericeous pubescence in abaxial costae and costules; costal scales present abaxially ..... *A. rudis* var. *rudis*

4. Laminar tissue abaxially covered only by uncinate hairs or glabrous; lacking sericeous pubescence in abaxial costae and costules; costal scales absent abaxially 5

5. Sori elongate along veins 6

6. Laminar tissue abaxially bearing numerous sessile, globular and yellowish to reddish glands; rachises densely hispid on all sides, all hairs acicular, hairs ≤ 0.1 mm long; laminar tissue adaxially conspicuously hirsute, hairs ≤ 0.1 mm long .... 3. *A. consimilis*

6. Laminar tissue abaxially lacking glands, or else bearing only few sessile, globular and yellowish to reddish glands; rachises densely pubescent but all hairs uncinate, hairs > 0.1 mm long; laminar tissue adaxially hirsute or strigulose, hairs > 0.1 mm 7

7. Indusia vestigial, ciliate and globular-glandular; aerophores at abaxial pinna bases, if present, clavate and covered by uncinate hairs; veins dark olivaceous to blackish; basal segments elongate and overlapping those of adjacent pinnae .... 4. *A. gracilis*

7. Indusia absent; aerophores at abaxial pinna bases, if present, elongate and glabrous; veins mostly stramineous; basal segments reduced and never overlapping those of adjacent pinnae .... 5. *A. heteroclita*

5. Sori round or ovate along veins 8

8. Rachises and costae abaxially densely pubescent, with long and robust acicular hairs, 0.7-1.5 mm long; whitish septate hairs present or not; veins and costules adaxially furnished with long and robust hairs similar to those on the abaxial side; laminar tissue adaxially bearing sessile, globular yellowish glands 9

9. Costae abaxially densely covered by long septate hairs, 4-5 cells per hair ... . 6b. *A. oligocarpa* var. *navarrensis*

9. Costae abaxially lacking long septate hairs, or if multicellular hairs present, with no more than 3 cells per hair .... 6a. *A. oligocarpa* var. *oligocarpa*

8. Rachises and costae abaxially densely or sparsely pubescent, lacking long and robust acicular hairs, hairs ≤ 0.4 mm long; whitish septate hairs always absent; veins and costules lacking long and robust hairs; laminar tissue adaxially eglandular 10

10. Aerophores at abaxial pinna bases deltate-elongate, sometimes coiled; laminae abruptly reduced proximally with more than 6 pairs of reduced pinnae .... 9. *A. germaniana*

10. Aerophores at abaxial pinna bases small, clavate; laminae gradually reduced proximally with fewer than 6 pairs of reduced pinnae 11

11. Indusia small, reduced to a lobe of tissue; most basal reduced proximal pinnae deltate-pinnatifid; pinnae sessile and equilateral with basal acroscopic segments about the same size as the basal basiscopic ones; segments linear-oblong, acute at apices, with > 15 pairs per pinnae, to 25 pairs on larger pinnae; rachises densely pubescent abaxially, hairs mostly acicular, with small capitate glands; abaxial laminar tissue densely pubescent; petioles and proximal third of rachises dark brown and matte, distal section of rachises stramineous .... 7. *A. intromissa*

11. Indusia absent; most basal reduced proximal pinnae auriculiform; pinnae subpetiolate and inequilateral with basal acroscopic segments larger than the basiscopic ones, this more evident at laminar bases; segments oblong-orbicular, rounded at apices, with up to 10 pairs per pinnae; rachises sparsely pubescent abaxially, hairs all uncinate, lacking small capitate glands; abaxial laminar tissue glabrous; petioles and

proximal third of rachises atropurpureous and somewhat lustrous, distal section of rachises light brown .... 8. *A. negligens*

1. Indusia present, persistent, large and obvious, round or reniform 12

12. Rachises bearing small proliferous bulbils at bases of some distal pinnae .... 9. *A. germaniana*

12. Rachises lacking proliferous bulbils in pinna axils 13

13. Scales present on rachises and/or costae 14

14. Main leaf axes densely covered in scales from petiole bases to distal pinnae 15

15. Rhizomes suberect to erect; leaves fasciculate; scales linear with entire margins, pubescent, dark brown and lustrous; hairs on rachises and costae abaxially long-acicular, none uncinate, ≤ 1 mm long; sori supramedial to submarginal on veins; indusia pubescent with both acicular and uncinate hairs; aerophores at abaxial pinna bases small, clavate, blackish and acicular-setulose .... 10. *A. inabonensis*

15. Rhizomes long-creeping; leaves distant to one another; scales cymbiform with erose margins, glabrous, castaneous, either lustrous or matte; hairs on rachises and costae abaxially long-uncinate, 0.5-0.7 mm long; sori pericostal to inframedial on veins; indusia pubescent with uncinate hairs only; aerophores at abaxial pinna bases large, deltate-acuminate, dark brown and uncinate-setulose .... 11. *A. rustica*

14. Main leaf axes sparsely scaly 16

16. Laminar tissue abaxially covered by both acicular and uncinate hairs; pubescence on abaxial costae and costules sericeous; abaxial costules conspicuously raised; costal scales present abaxially .... *A. rudis* var. *rudis*

16. Laminar tissue abaxially covered only by uncinate hairs, or glabrous; pubescence on abaxial costae and costules hirsute; abaxial costules complanate; costal scales absent abaxially .... 9. *A. germaniana*

13. Scales essentially absent from rachises and costae 17

17. Aerophores at abaxial pinna bases elongate, obvious; abaxial hairs all uncinate (including indusial hairs); petioles atropurpureous proximally; veins 2-5 pairs on largest segments .... 12. *A. hydrophila*

17. Aerophores at abaxial pinna bases absent, or if present clavate and obscure; abaxial hairs uncinate and acicular (including indusial hairs); petioles dark gray proximally; veins 6-11 pairs on largest segments 18

18. Rachises and costae abaxially densely pubescent with long and robust acicular hairs, 0.7-1.5 mm long; whitish septate hairs present or not; veins and costules adaxially furnished with long and robust hairs similar to those on the abaxial side; laminar tissue adaxially globular-glandular; laminae abruptly reduced proximally, up to 6 pairs of reduced pinnae 19

19. Abaxial costae densely covered by long septate hairs, 4-5 cells per hair .... 6b. *A. oligocarpa* var. *navarrensis*

19. Abaxial costae lacking long septate hairs, or if multicellular hairs present, with no more than 3 cells per hair .... 6a. *A. oligocarpa* var. *oligocarpa*

18. Rachises and costae abaxially sparsely pubescent, lacking long and robust acicular hairs, hairs ≤ 0.4 mm long; whitish septate hairs always absent; veins and costules adaxially lacking long and robust hairs; laminar tissue adaxially eglandular; laminae gradually reduced proximally, up to 12 pairs of reduced pinnae 20

20. Rachises minutely pubescent abaxially, hairs 0.05-0.1 mm long; basal segments longer than the rest; segments with truncate apices and margins revolute; veins 5-7(-9) pairs on largest segments; reduced proximal pinnae to 6 pairs; indusia pubescent, if ciliate, hairs uncinate and acicular; laminar tissue abaxially pubescent or glabrescent .... 13. *A. antillana*

20. Rachises sparsely pubescent abaxially, hairs 0.2-0.4 mm long; basal segments smaller than the rest, or the basal acroscopic ones larger and basal basiscopic ones smaller; segments with round to acute apices and margins undulate, not revolute; veins 7-11 pairs on largest segments; reduced proximal pinnae to 12 pairs; indusia ciliate, hairs all uncinate; laminar tissue abaxially always pubescent .... 14. *A. scalaris*

1. ***Amauropelta rupestris*** (Klotzsch) O. Alvarez, this dissertation, Chapter 3: 44. 2010. *Leptogramma rupestris* Klotzsch, Linnaea 20: 415. 1847. *Gymnogramma rupestris* (Klotzsch) Kunze, Linnaea 23: 256. 1850. *Phegopteris rupestris* (Klotzsch) Mett., Fil. Hort. Bot. Lips. 82. 1856. *Dryopteris rupestris* (Klotzsch) C.Chr., Index Filic. 290. 1905. *Thelypteris rupestris* (Klotzsch) C.F. Reed, Phytologia 17: 310. 1968.—Type. VENEZUELA, **Aragua**: "Colonia Tovar Columbiae", *Moritz 241* (holotype: P [digital photo!]; isotypes: C, HBG [photos deposited at GH!, MICH!], P [digital photo!]).

Gymnogramma diplazioides Desv., Mém. Soc. Linn. Paris 6: 214. 1827. *Phegopteris diplazioides* (Desv.) Mett., Ann. Sci. Nat., Bot., sér. 5, 2: 241. 1864. *Leptogramma diplazioides* (Desv.) Underw., Bull. Torrey Bot. Club

29: 626. 1902. *Dryopteris diplazioides* (Desv.) Urb., Symb. Antill. (Urban). 4: 21. 1903; *non* (Moritz ex Mett.) Kuntze 1891. *Nephrodium diplazioides* (Desv.) Hieron., Bot. Jahrb. Syst. 34: 445. 1904; *non* (Moritz ex Mett.) Hook. 1862. *Thelypteris diplazioides* (Desv.) Proctor, Bull. Inst. Jamaica, Sci. Ser. 5: 59. 1953; *non* (Moritz ex Mett.) Ching 1941. *Amauropelta diplazioides* (Desv.) Pic. Serm., Webbia 31: 251. 1977.—Type. HAITI: "Habitat in Hispaniola", *Anon.* (holotype: P [photo deposited at GH!]).

Aspidium diplazioides Moritz ex Mett., Abh. Senckenberg. Naturf. Ges. 2 : 367. 1858. *Nephrodium diplazioides* (Moritz ex Mett.) Hook., Sp. Fil. 4: 99. 1862; *non* (Desv.) Hieron. 1904. *Dryopteris diplazioides* (Moritz ex Mett.) Kuntze, Revis. Gen. Pl. 2: 812. 1891; *non* (Desv.) Urb. 1903. *Dryopteris moritziana* Urb., Symb. Antill. (Urban). 4: 21. 1903. *nom. illeg. Thelypteris diplazioides* (Moritz ex Mett.) Ching, Bull. Fan Mem. Inst. Biol. Bot. 10: 251. 1941; *non* (Desv.) Proctor 1953.—Type. VENEZUELA, **Aragua**: Tovar, *Moritz 408* (holotype: P [digital photo!]; isotypes: B [digital photo!], HBG [photos deposited at GH!, US!], P [digital photo!], US [fragment!])

Rhizomes suberect to erect, 1.13-1.74 cm in diameter, with numerous scales at apices; *scales* 6.5-14 mm long, 1.2-3 mm wide, castaneous, lustrous, ovate-lanceolate to lanceolate, attenuate at apices, clathrate, densely pubescent, hairs short acicular, < 0.1 mm long, patent, eglandular. *Leaves* monomorphic, with main axis adaxially sulcate to bisulcate, ascending in fascicles, 32.77-141.96 cm long. *Petioles* 5.47-31.36 cm long, 1.6-4.4 mm in diameter, dark brown proximally, light brown to stramineous distally, densely pubescent, hairs short acicular to 0.1 mm long, retrorse and fully appressed, eglandular, with some sparse scales similar to those of rhizomes but smaller, somewhat fully appressed. *Rachises* light brown to stramineous, densely pubescent on all sides, with hairs short acicular to 0.1 mm long, retrorse and fully appressed, longer hairs, 0.2-0.5 mm long, some uncinate but mainly acicular, on adaxial sulci distally, mostly patent, some antrorsely appressed, eglandular, with some scales dispersed, scales similar to those of rhizomes but smaller. *Laminae* pinnate-pinnatifid, thick and coriaceous, 27.3-122.02 cm long, 15.32-24.06 cm wide, oblong-lanceolate, attenuate at apices, somewhat abruptly reduced proximally, 6-10 pairs of reduced proximal pinnae, those elliptic-pinnatifid, with acute apices, most basal ones deltate-ovate; *laminar tissue* somewhat densely pubescent on both sides, most abaxial hairs uncinate, few acicular, to 0.2 mm long, mostly patent, some antrorsely appressed, adaxial hairs all acicular, 0.1-0.16(-0.2) mm long, antrorse and fully appressed, eglandular. *Pinnae* sessile, 5.27-14.59 cm long, 1.34-2.4 cm wide, 18-40 pairs, alternate, oblong-lanceolate, long-acuminate at apices, with medium sinuses, proliferous bulbils nearly always present on acroscopic axils on adaxial side of distal pinnae, those covered by small, pubescent scales; *aerophores* absent; *costae* adaxially sulcate, somewhat densely pubescent on both sides, abaxial hairs all acicular, 0.1-0.2 mm long, antrorse and fully appressed, adaxial hairs all acicular, mainly at margins of sulci, hairs 0.2-0.4 mm long, antrorse and fully appressed, eglandular, with at least a few persistent to deciduous scales, only present at costular bases, very small, to 0.5 mm long, 0.1-0.15 mm wide, light brown, linear-lanceolate, clathrate and glabrous, with thick whitish margins; *segments* somewhat oblique, 0.30-0.55 cm wide, oblong, apices obtuse, with margins entire to slightly crenate, basal segments similar in size and shape to the remaining segments in the pinnae, or else reduced; *costa-sinus distance* (1.6-)2-5 mm; *costules* densely to sparsely pubescent on both sides, abaxial hairs all acicular, 0.1-0.2 mm long, antrorse and fully appressed, adaxial hairs all acicular, 0.1-0.16(-0.2) mm long, antrorse and fully appressed, eglandular; *veins* complanate on both sides, some basal veins reaching the margins of segments at sinus, not above, 6-8 pairs per segment, dark green abaxially, simple, sparsely pubescent on both sides, abaxial hairs all acicular, 0.1-0.2 mm long, antrorse and fully appressed, adaxial hairs all acicular, 0.1-0.16(-0.2) mm long, antrorse and fully appressed, eglandular. *Sori* elongate along veins; *indusia* absent; *sporangia* glabrous. Figure 25.

General Distribution. Panama, Colombia, Venezuela, and the Caribbean (Greater Antilles: Hispaniola and Jamaica).

Distribution and Habitat in the Caribbean. Hispaniola; cloud forests in the south-western part of the island, which includes the Massif de la Selle in Haiti, and the Sierra de Baoruco in Dominican Republic; one population in the vicinity of Fonds Verrettes, Dept. du Ouest, Haiti, collected in 1920 but probably extinct due to total deforestation of the area. In Jamaica, the species is confined to the Port Royal Mountains, growing in moist shaded riverbeds, wet ravines, and near trails in wet montane forests; (720-)1000-2000 m.

ADDITIONAL SPECIMENS EXAMINED (Appendix B).

Figure 25. *Amauropelta rupestris*. Specimen (*Holdridge 1984*, GH).

The presence of elongate sori lacking indusia, proliferous bulbils on axils of distal pinnae (Figure 20A, B), and the characteristic strigulose pubescence on adaxial costae and laminar tissue, had led to a historical misidentification of *A. rupestris* as *A. linkiana*. Both species are superficially similar morphologically but *A. rupestris* is distinguished from *A. linkiana* by its unique pubescence in petioles and rachises, with short acicular hairs to 0.1 mm long, all fully appressed and directed proximally (Figure 21E and Figure 23D); fully appressed hairs on abaxial costae, those directed distally; lack of aerophores at abaxial pinna bases; and the presence of up to 10 pairs of reduced, elliptic to deltate-ovate, proximal pinnae. *Amauropelta linkiana* has uncinate to acicular hairs to 0.2 mm long, patent or somewhat antrorsely appressed; hairs on abaxial costae also patent; a blackish aerophore at abaxial pinna bases (Figure 20D); and up to 5 pairs of reduced, oblong-pinnatifid, proximal pinnae.

Amauropelta rupestris is the Caribbean amauropeltoid species with the largest separation, up to 5 mm, between the costae and the sinuses formed by adjacent segments.

Interestingly enough, the specific epithet *diplazioides* has been used twice for this species. *Gymnogramma diplazioides* Desv. has been historically placed in the synonymy with both *A. rupestris* and *A. linkiana* (Proctor 1977, 1985a). The poor understanding of Desvaux's concept of *G. diplazioides*, and a somehow poor comparison between the type of *G. diplazioides* and available specimens, which are very limited, had undoubtedly led to the common misidentification of *A. rupestris* as *A. linkiana*. The specific epithet *diplazioides* has preferences over *rupestris*, however. Because of the aforementioned nomenclatural problems, I have preserved *rupestris* over *diplazioides*.

The Jamaican specimen cited by others as *A. rupestris* (Proctor 1985a), *Gilbert s.n.* (GH), from the Cuna-Cuna Pass, is *A. linkiana*, and a careful review of all the Jamaican specimens of *A. rupestris* is called for. Another specimen, *Smith 997* (GH), from Santa Marta in Colombia, is a hybrid between *A. rupestris* and another unknown parent.

2. *Amauropelta linkiana* (C. Presl) O. Alvarez, this dissertation, Chapter 3: 39. 2010.

Grammitis linkiana C. Presl, Tent. Pterid. 209. 1836. *Gymnogramma polypodioides* Link, Hort. Berol. [Link] 2: 50. 1833 (*non* Spreng. 1827) *nom. illeg. Leptogramma linkiana* (C. Presl) J. Sm., J. Bot. (Hooker) 4: 52. 1841. *Gymnogramma linkiana* (C. Presl) Kunze, Linnaea 18: 310. 1844. *Phegopteris linkiana* (C. Presl) Mett., Fil. Hort. Bot. Lips. 82. 1856. *Nephrodium linkianum* (C. Presl) Diels, Nat. Pflanzenfam. [Engler & Prantl] 1, Abt. 4: 172. 1899. *Dryopteris linkiana* (C. Presl) Maxon, J. Wash. Acad. Sci. 14: 199. 1924. *Lastrea linkiana* (C. Presl) Copel., Gen. Fil. (Ann. Cryptog. Phytopathol. 5) 139. 1947. *Thelypteris linkiana* (C. Presl) R.M. Tryon, Rhodora 69: 6. 1967.—Type. Cultivated specimen, "H[ortus] B[erolinensis]", ex herb., *Link s.n.* (holotype: B [digital photo!]).

Phegopteris duchassaingiana Fée, Mém. Foug., 11. Hist. Foug. Antil. 57, t. 14, f. 3. 1866.—Type. GUADELOUPE: *L'Herminier s.n.* (holotype: P [digital photo! and photo deposited at US!]; isotype: P [digital photo!]).

Rhizomes erect, 1.2-1.91 cm in diameter, with numerous scales at apices; *scales* 3-6 mm long, 0.9-2 mm wide, mostly light brown, matte, lanceolate-acuminate, subclathrate, sparsely to somewhat densely pubescent, hairs short acicular and uncinate, < 0.1 mm long, eglandular. *Leaves* monomorphic, with main axis adaxially sulcate to bisulcate, ascending in fascicles, 34.87-88.97 cm long. *Petioles* 7.36-22.42 cm long, 0.26-3.2 mm in diameter, dark brown proximally, light brown to stramineous distally, sparsely to somewhat densely pubescent, more glabrescent abaxially, most hairs short-uncinate and some acicular, 0.1-0.12 (rarely 0.2) mm long, patent, eglandular, scaly proximally, scales similar to those of rhizomes. *Rachises* light brown to stramineous, densely pubescent on adaxial sulci with acicular hairs to 0.2 mm long, patent, sparsely to somewhat densely pubescent elsewhere, most hairs uncinate, 0.1-0.2 mm long, patent, eglandular, with few and sparse small scales, those light brown, lustrous, linear, subclathrate, pubescent and eglandular, or else lacking scales. *Laminae* pinnate-pinnatifid, thick and coriaceous, 25.46-69.77 cm long, 9.13-21.37 cm wide, lanceolate, attenuate at apices, abruptly reduced proximally, 3-5 (rarely 9) pairs of reduced proximal pinnae, those oblong-lanceolate-pinnatifid, acuminate at apices, most basal ones deltate-tripartite; *laminar tissue* densely to sparsely pubescent, or glabrescent, on both sides, abaxial hairs all uncinate, 0.1-0.2 mm long, patent, adaxial hairs acicular and fully appressed, 0.1-0.15 mm long, eglandular. *Pinnae* subpetiolate to sessile, 4.63-10.6 cm long, 0.91-2.11 cm wide, 18-25 pairs, alternate, oblong-lanceolate, acuminate at apices, with medium to deep sinuses, proliferous bulbils nearly always present in acroscopic axils on adaxial side of distal pinnae, those covered by uncinate hairs; *aerophores* present, clavate, somewhat elongated to auriculiform, blackish, bearing numerous small uncinate hairs; *costae* adaxially sulcate, densely to sparsely pubescent on both sides, abaxial hairs all uncinate, 0.1-0.2 mm long, patent, adaxial hairs all acicular, 0.1-0.2 mm long, appressed along the margins of sulci, eglandular, costal scales lacking; *segments* oblique, 0.23-0.56 cm wide, oblong, apices apiculate to obtuse, with margins entire to slightly crenate, basal segments elongated; *costa-sinus distance* 1.6-3.75 mm; *costules* somewhat densely pubescent to glabrescent, especially abaxially, abaxial hairs all uncinate, 0.1-0.2 mm long, patent, adaxial hairs all acicular, 0.1-0.2 mm long, appressed, eglandular; *veins* complanate on both sides, some basal veins reaching the margins of segments at sinus, not above, (6-)7-9(-10) pairs per segment, blackish to dark green abaxially, simple, sparsely pubescent on both sides, abaxial hairs all uncinate, 0.1-0.2 mm long, patent, adaxial hairs all acicular, 0.1-0.15(-0.2) mm long, appressed, eglandular. *Sori* elongate along veins; *indusia* absent; *sporangia* glabrous. Figure 26.

General Distribution. Continental tropical America from Mexico to Brazil, Ecuador, Peru, Bolivia, and the Caribbean (Greater Antilles: Cuba, Hispaniola and Jamaica; Lesser Antilles: Guadeloupe and Martinique).

Distribution and Habitat in the Caribbean. Cuba; secondary vegetation associated with riparian forests in the massif of the Sierra Maestra (Sánchez & al. 2006). In Hispaniola, the species also grows along water courses, in moist forests, or in very humid forests of the Cordillera Central. In Guadeloupe and Martinique the species grows in wet montane forest, in slopes, ravines, or along streams; (250-)600-1350 m. In Jamaica the species also grows in wet montane forests in the Cuna Cuna Pass.

ADDITIONAL SPECIMENS EXAMINED (Appendix B).

Figure 26. *Amauropelta linkiana*. Specimen (*Pére Duss s.n., 1899*, US).

Amauropelta linkiana is more closely related to *A. rupestris*. The discussion of those characters that separate these two species is presented above under *A. rupestris*.

Immature individuals of *A. germaniana*, especially those from the Lesser Antilles, resemble *A. linkiana*. Together with the similarity in habit, the Lesser Antillean *A. germaniana* also bears proliferous bulbils in distal pinnae. However, these species can be separated by the presence of elongate and exindusiate sori in *A. linkiana* (Figure 23C), and also by the presence of short, clavate and blackish (Figure 20D), aerophores on abaxial pinna bases. In contrast, *A. germaniana* has round, always indusiate sori with greenish reniform, or small, ear-like lobes, indusia, and also elongate, deltate and brownish (Figure 20C), aerophores on abaxial pinna bases.

All the examined specimens of *A. linkiana* from the Lesser Antilles have laminar tissue glabrescent to glabrous.

3. ***Amauropelta consimilis*** (Fée ex Baker) O. Alvarez, this dissertation, Chapter 3: 35. 2010. *Gymnogramma gracilis* var. *consimilis* Fée ex Baker, Syn. Fil. (Hooker & Baker) 377. 1868. *Gymnogramma consimilis* (Fée ex Baker) Jenman, Bull. Bot. Dept. Jamaica, n.s. 4: 203. 1897. *Dryopteris consimilis* (Fée ex Baker) C.Chr., Kongel. Danske Vidensk. Selsk. Skr., Naturvidensk. Math. Afd., ser. 7, 4: 314. *f. 37*. 1907. *Thelypteris consimilis* (Fée ex Baker) Proctor, Rhodora 68: 468. 1966.—Type. GUADELOUPE: *L'Herminier 73* (holotype: L [photo deposited at MICH!]).

Dryopteris mollicella Maxon, Proc. Biol. Soc. Wash. 36: 49. 1923. *Thelypteris mollicella* (Maxon) Ching, Bull. Fan Mem. Inst. Biol. Bot. 10: 252. 1941.—

Type. DOMINICA: Dominica, *Bailey 771* (holotype: US!; isotype: P [digital photo!]).

Rhizomes long-creeping to suberect, 0.84-1.23 cm in diameter, with numerous scales at apices; *scales* 3.1-7.5 mm long, 0.75-1.8 mm wide, light brown, lustrous, ovate-oblong to deltate-lanceolate, acuminate at apices, sparsely pubescent, most hairs acicular, some uncinate, 0.06-0.1 mm long, eglandular. *Leaves* monomorphic, with main axis adaxially sulcate, ascending in fascicles or growing at a short distance from one another, 20.76-50.97 cm long. *Petioles* 3.42-6.91 cm long, 0.9-1.7 mm in diameter, dark brown proximally, light brown to olivaceous distally, densely pubescent, hirsute, hairs all acicular, 0.06-0.1 mm long, mostly patent, eglandular, scaly proximally, scales similar to those of rhizomes but smaller. *Rachises* light brown to olivaceous, stramineous distally, densely pubescent, hirsute, hairs all acicular, 0.06-0.1 mm long, patent to slightly appressed on adaxial sulci, those up to 0.2 mm long, eglandular, scales lacking. *Laminae* pinnate-pinnatifid, thin and herbaceous, 17.07-44.06 cm long, 5.69-12.83 cm wide, lanceolate-elliptic, acuminate at apices, abruptly reduced proximally except the most distal pair, 3-6 pairs of reduced proximal pinnae, oblong-pinnatifid, short-acuminate to blunt at apices, most basal ones tripartite, with basal acroscopic and medial segments larger than the rest, to auriculate; *laminar tissue* densely pubescent on both sides, abaxial hairs all uncinate, 0.1-0.2 mm long, patent, adaxial hairs all acicular, 0.1-0.12 mm long, fully appressed, densely glandular below with subdeciduous sessile, orangish to reddish, globular glands. *Pinnae* sessile, 2.89-7.93 cm long, 0.85-1.84 cm wide, 15-26 pairs, alternate, oblong-lanceolate, attenuate at apices, deeply dissected, proliferous bulbils absent; *aerophores* absent; *costae* adaxially sulcate, densely pubescent on both sides, densely hirsute abaxially, abaxial hairs mainly acicular, $\leq$ 0.1 mm long, and some uncinate distally, hairs patent, adaxial hairs all acicular, 0.16-0.3 mm long, strigulose along the sulci margins, eglandular, costal scales lacking; *segments* oblique, 0.27-0.43 cm wide, oblong, apices obtuse to mostly cuspidate or acute, with margins entire or slightly crenate, basal segments smaller than the rest; *costa-sinus distance* 0.49-0.8 mm; *costules* somewhat densely pubescent on both sides, abaxial hairs uncinate and short acicular, to 0.2 mm long, adaxial hairs all acicular, 0.16-0.3 mm long, fully appressed, eglandular; *veins* essentially complanate on both sides, (4-)5-7(-8) pairs per segment, dark olivaceous abaxially, simple, sparsely pubescent abaxially and densely pubescent adaxially, abaxial hairs uncinate and short acicular, to 0.2 mm long, adaxial hairs all acicular, 0.16-0.3 mm long, fully appressed, eglandular. *Sori* round, medial on veins, to somewhat elliptical; *indusia* obscure, deciduous or persistent, small, ear-like, crème to light brown, ciliate, bearing uncinate hairs, 0.12-0.2 mm long, eglandular; *sporangia* glabrous. Figure 27.

General Distribution. Endemic to the Caribbean (Lesser Antilles: Guadeloupe, Dominica, Martinique, and St. Vincent).

Distribution and Habitat in the Caribbean. Guadeloupe, Dominica, Martinique, and St. Vincent; at the edge of wet montane forests, mossy woodland, and riparian forests near water courses; the species can also grow exposed to full sunlight in pasturelands; 50-1100 m.

ADDITIONAL SPECIMENS EXAMINED (Appendix B).

Figure 27. *Amauropelta consimilis*. Specimen (*Proctor 20328*, A).

Amauropelta consimilis has been treated as a synonym of *A. gracilis* since 1953 (Proctor 1953). *Amauropelta consimilis* can be easily distinguished from *A. gracilis* by its densely hispid rachises (Figure 21A), with short acicular hairs, no longer than 0.1 mm. *Amauropelta gracilis* has densely pubescent rachises (Figure 21B), with uncinate hairs always larger than 0.1 mm. *Amauropelta consimilis* also bears numerous sessile, reddish, globular glands on laminar tissue abaxially (Figure 23A), while *A. gracilis* bears only a few such glands abaxially, mainly at costae and indusial margins. Another character that separates both species is the long-creeping rhizome observed in *A. consimilis*, while *A. gracilis* has a more erect rhizome.

4. *Amauropelta gracilis* (Heward) O. Alvarez, this dissertation, Chapter 3: 38. 2010.

Gymnogramma gracilis Heward, Mag. Nat. Hist., ser. 2, 2: 457. 1838. *Leptogramma gracilis* (Heward) J. Sm., J. Bot. (Hooker) 4: 52. 1841. *Grammitis hewardii* T. Moore, Gard. Chron. 261. 1856. (based on *G. gracilis* Heward). *nom. illeg. Polypodium hewardii* (T. Moore) Griseb., Fl. Brit. W.I. [Grisebach]. 696. 1864. *Dryopteris gracilis* (Heward) Domin, Rozpr. Kral. Ceske Spolecn. Nauk, Tr. Mat.-Prir., N.s. 2: 210. 1929. *Thelypteris gracilis* (Heward) Proctor, Bull. Inst. Jamaica, Sci. Ser. 5: 60. 1953.—Type. JAMAICA. **Manchester**: From Old England, 1824, *Heward s.n.* (holotype: K).

Rhizomes erect, sometimes massive, 0.92-1.65 cm in diameter, with numerous scales at apices; *scales* 4-5.65 mm long, 1.25-2 mm wide, castaneous to golden brown, lustrous, ovate-lanceolate to deltate-lanceolate, acuminate at apices, clathrate, sparsely pubescent, hairs uncinate, mainly at bases, 0.1-0.2 mm long, eglandular. *Leaves* monomorphic, with main axis adaxially sulcate to bisulcate, ascending in fascicles, 36.7-85.51 cm long. *Petioles* 4.79-9.19 cm long, 3.1-4.0 mm in diameter, dark brown proximally, light brown to olivaceous distally, densely pubescent, most hairs uncinate, only few acicular, 0.06-0.2 mm long, patent, eglandular, with some sparse scales, those small, 2.75-4.5 mm long, ovate with apices apiculate, clathrate, pubescent and eglandular. *Rachises* light brown to olivaceous, densely pubescent on all sides, hairs all uncinate, 0.12-0.4 mm long, patent, eglandular and lacking scales. *Laminae* pinnate-pinnatifid, thin and herbaceous, 31.91-77.89 cm long, 17.86-21.52 cm wide, oblong-lanceolate to ovate-lanceolate, long-acuminate at apices, gradually to somewhat abruptly reduced proximally, 5-8 pairs of reduced proximal pinnae, those oblong-lanceolate-pinnatifid distally to deltate-pinnatifid proximally, most basal ones deltate to auriculiform; *laminar tissue* densely pubescent on both sides, abaxial hairs all uncinate, 0.1-0.3 mm long, patent, adaxial hairs all acicular, 0.1-0.2 mm long, patent to fully appressed, mostly eglandular, some deciduous, isolated glands present on abaxial tissue, those globular, sessile, and yellowish to reddish. *Pinnae* sessile, 9.08-10.89 cm long, 1.55-2.32 cm wide, 15-35 pairs, subopposite to alternate, oblong-lanceolate, long-caudate at apices, with deep sinuses, proliferous bulbils absent; *aerophores* mostly absent, if present, small, clavate and covered by uncinate hairs; *costae* adaxially sulcate, densely pubescent on both sides, abaxial hairs all uncinate, 0.1-0.3 mm long, patent, adaxial hairs all acicular, 0.1-0.3 mm long, appressed, mostly eglandular, or sparsely globular-glandular abaxially, costal scales lacking; *segments* somewhat oblique, 0.31-0.40 cm wide, oblong, apices acute to obtuse, with margins somewhat revolute, entire, slightly crenate or dentate, basal segments slightly to obviously elongated, auriculate at bases of basal basiscopic ones, auricles small, basal segments overlapping the rachises and, sometimes segments of adjacent pinnae; *costa-sinus distance* 0.75-1.05 mm; *costules* somewhat densely pubescent on both sides, abaxial hairs all uncinate, 0.1-0.3 mm long, patent, adaxial hairs all acicular, 0.1-0.2 mm long, patent to fully appressed, mostly eglandular, or sparsely globular-glandular abaxially; *veins* complanate on both sides, 6-10(-11) pairs per segment, blackish to dark olivaceous abaxially, simple, sometimes bifurcate at proximal segments, somewhat densely pubescent on both sides, abaxial hairs all uncinate, 0.1-0.3 mm long, patent, adaxial hairs all acicular, 0.1-0.2 mm long, patent to fully appressed, mostly eglandular. *Sori* round to somewhat elongated along veins, supramedial to submarginal; *indusia* obscure, deciduous to persistent, ear-like, light brown, sparsely hairy, bearing uncinate hairs to 0.3 mm long, globular-glandular at margins; *sporangia* glabrous. Figure 28.

General Distribution. Endemic to the Caribbean (Greater Antilles: Cuba and Jamaica).

Distribution and Habitat in the Caribbean. Cuba; montane wet forests at the massif of the Sierra Maestra in eastern Cuba: Pico La Bayamesa, Loma del Gato, and Gran Piedra; also growing in secondary forests in western Cuba (Sánchez & al. 2006), in shaded areas or exposed to full sunlight, always above 600 m. In Jamaica, the species occurs in several parishes, mostly found at edge of forests, in partially to fully shaded banks along trails, or limestone ravines, or exposed to full sunlight on grassy banks; the species is especially common in the eastern massifs of the Blue Mountains, John Crow Mountains, and Port Royal Mountains; (200-)600-1100 m.

ADDITIONAL SPECIMENS EXAMINED (Appendix B).

Amauropelta gracilis is morphologically similar to *A. consimilis* from the Lesser Antilles. Based on the specimens observed, I did not see any individuals from *A. gracilis* in the Lesser Antilles. Those characters that separate these species are discussed above under *A. consimilis*.

Large individuals of *A. gracilis* are hard to discriminate from *A. heteroclita*. However, *A. gracilis* can be distinguished from *A. heteroclita* by its indusia, which are small, ear-like lobes of tissue that are ciliate and globular-glandular at their margins, by its elongated basal segments that overlaps those of adjacent pinnae, its basal basiscopic segments that are always auriculate, and by having uncinate hairs on its clavate aerophores. *Amauropelta heteroclita* is exindusiate, the basal segments are somewhat reduced and never overlap those of adjacent pinnae, and although the aerophores are lacking in medial pinnae, there is an obvious blackish depression in their places. Overall, *A. heteroclita* is a larger plant than *A. gracilis*. The specimen *Maxon & Killip 1472* from Jamaica is probably a hybrid between *A. heteroclita* and *A. gracilis*.

Figure 28. *Amauropelta gracilis*. Specimen (*Maxon 8849*, US).

5. *Amauropelta heteroclita* (Desvaux) Pic. Serm., Webbia 31: 251. 1977. *Polypodium heteroclitum* Desvaux, Mag. Neuesten Entdeck. Gesammten Naturk. Ges. Naturf. Freunde Berlin 5: 318. 1811. *Phegopteris heteroclita* (Desvaux) Kuhn ex Krug, Bot. Jahrb. Syst. 24: 133. 1897. *Dryopteris heteroclita* (Desvaux) C.Chr., Index Filic. 270. 1905. *Thelypteris heteroclita* (Desvaux) Ching, Bull. Fan Mem. Inst. Biol. Bot. 10: 252. 1941. *Lastrea heteroclita* (Desvaux) Copel., Gen. Fil. (Ann. Cryptog. Phytopathol. 5) 139. 1947.—Type. JAMAICA: Unknown locality, probably collected by *de Tussac* (lectotype chosen by Proctor 1985: 306: P).

Polypodium involutum Desvaux, Mag. Neuesten Entdeck. Gesammten Naturk. Ges. Naturf. Freunde Berlin 5: 318. 1811; *non* Baker 1889.—Type. WEST INDIES: "Habitat in Antillis", from the West Indies without exact locality, probably collected by *de Tussac* (lectotype chosen by Proctor 1985: 306: P).

Rhizomes creeping to erect, sometimes massive, 2.56-3.92 cm in diameter, bearing numerous scales at apices; *scales* 3.08-7 mm long, 1.12-2.45 mm wide, castaneous to golden brown, lustrous, deltate, deltate-lanceolate to lanceolate, long-acuminate at apices, subclathrate, sparsely to densely pubescent, hairs short acicular, 0.1-0.14 mm long, patent, eglandular. *Leaves* monomorphic, with main axis adaxially sulcate to bisulcate, ascending in fascicles, 82.81-116.82 cm long. *Petioles* 6.69-22.57 cm long, 2.9-5.6 mm in diameter, dark brown proximally, dark olivaceous to stramineous distally, more or less densely pubescent, hairs all uncinate, 0.1-0.2 mm long, patent, eglandular, densely to sparsely scaly, always denser proximally, scales similar to those of rhizomes but smaller, 4.4 mm long, 2.16 mm wide. *Rachises* olivaceous to stramineous, reddish sometimes, somewhat densely pubescent on all sides, or pubescent only on the adaxial sulci, hairs all uncinate, 0.15-0.4 mm long, mostly patent, eglandular, petiolar scales go up to the second pair of reduced proximal pinnae, lacking scales elsewhere. *Laminae* pinnate-pinnatifid, thick and coriaceous, 76.12-99.18 cm long, 20.74-27.51 cm wide, oblong-lanceolate, long-acuminate at apices, abruptly reduced proximally, 8-10 pairs of reduced proximal pinnae, those from oblong-lanceolate-pinnatifid, short-acuminate with basal segments elongated, to ovate-lanceolate-pinnatifid, long-acuminate, most basal ones auriculiform; *laminar tissue* sparsely to somewhat densely pubescent on both sides, abaxial hairs all uncinate, 0.15-0.4 mm long, patent, adaxial hairs all acicular, 0.1-0.2 mm long, some appressed but mostly patent, eglandular. *Pinnae* subpetiolate to sessile, 13.61-15.35 cm long, 2.62-2.88 cm wide, 25-40 pairs, alternate, oblong-lanceolate, long-attenuate at apices, with deep sinuses, proliferous bulbils absent; *aerophores* mostly absent, obviously deciduous, if present and persistent, round and rugose (more evident at reduced proximal pinnae) to somewhat elongated and pubescent, in most cases represented by a blackish depression in the swollen area where the pinna is inserted; *costae* adaxially sulcate, sparsely pubescent on both sides, sometimes glabrescent below and pubescent on adaxial sulci only, abaxial hairs all uncinate, 0.15-0.4 mm long, patent, adaxial hairs all acicular, 0.15-0.3 mm long, patent to somewhat appressed, eglandular and lacking costal scales; *segments* somewhat to obviously oblique, 0.31-0.47 cm wide, oblong, apices acute to obtuse or apiculate, with margins entire to slightly crenate, basal segments reduced, basal basiscopic sometimes auriculate; *costa-sinus distance* 0.4-1.1 mm; *costules* sparsely pubescent to glabrescent on both sides, abaxial hairs all uncinate, 0.1-0.3 mm long, patent, adaxial hairs all acicular, 0.1-0.2 mm long, patent, eglandular, adaxial costules conspicuously stramineous to whitish, highly contrasting with the dark-green of laminar tissue; *veins* complanate on both sides, 9-16 pairs per segment, mostly stramineous and lustrous to sometimes dark olivaceous abaxially, simple, sparsely pubescent to glabrous on both sides, if hairy abaxially, the hairs all uncinate, 0.1-0.3 mm long, patent, if hairy adaxially, the hairs all acicular, 0.1-0.2 mm long, patent, eglandular, adaxial veins conspicuously stramineous to whitish, highly contrasting with the dark-green of laminar tissue. *Sori* round to elongate along veins, medial to submarginal; *indusia* absent; *sporangia* glabrous. Figure 29.

General Distribution. Endemic to the Caribbean (Greater Antilles: Cuba, Hispaniola, and Jamaica).

Distribution and Habitat in the Caribbean. Cuba; wet montane forest on eastern side of island in the massif of the Sierra Maestra: Pico La Bayamesa, Loma del Gato, Gran Piedra (see Sánchez & al. 2006). The species grows along water courses, in partial shade. It is rare in Cuba. In Hispaniola, the species grows in cloud forests along streams and trails in the southwestern part of the island, including part of the Cordillera Central and Sierra de Baoruco in Dominican Republic, and the Massif de la Selle in Haiti. In Jamaica the species is found in shaded banks of wet stream gullies, in moist forests and elfin woodland at the Blue Mountain peak; it also occurs in the whole Blue Mountain range in the parishes of Portland, St. Andrew, and St. Thomas and on Mount Diablo in the parish of St. Catherine, in partial shade or exposed to full sunlight in limestone ravines; 450-2250 m.

ADDITIONAL SPECIMENS EXAMINED (Appendix B).

The center of diversity of *A. heteroclita* is probably Jamaica; this assertion is based on the large number of specimens that I have seen from this island. The occurrence of *A. heteroclita* in the Greater Antilles islands of Cuba and Hispaniola is poorly documented with few specimens collected from those islands.

Individuals from Cuba and Hispaniola differ from those of Jamaica by the presence of an obvious aerophore at each medial pinna base, and by lacking the outstanding blackish scar at abaxial pinna bases, that clearly characterize the Jamaican specimens.

Distinguishing large specimens of *A. heteroclita* from large specimens of *A. gracilis* (see discussion under *A. gracilis*) and *A. germaniana* can be challenging. I will discuss here the differences between *A. heteroclita* and those *A. germaniana* that occur in Cuba and Hispaniola; *A. germaniana* from the Lesser Antilles and elsewhere are clearly distinct from *A. heteroclita* and these differences are discussed elsewhere (see *A. germaniana* below).

Amauropelta germaniana differs from *A. heteroclita* by lacking the obvious swollen tissue in abaxial rachises and, therefore, lacking the blackish scar seen in *A. heteroclita*. Also, *A. germaniana* has persistent aerophores in medial pinnae, which are deltate-elongate, and sometimes coiled, round to elliptical sori, have indusia, and densely scaly petioles and rachis bases with scales somewhat to fully appressed. *Amauropelta heteroclita* lacks aerophores in medial pinnae, or if they are present they are small and

Figure 29. *Amauropelta heteroclita*. Specimen (*Maxon 1453*, US).

clavate, with elongate to somewhat elliptical sori along the veins, are exindusiate, and lack scales on rachises, and have fewer petiolar scales than in *A. germaniana*.

Finally, *A. heteroclita* has costules and veins that are conspicuously stramineous to whitish on their adaxial surface contrasting highly with the dark green of the laminar tissue, while *A. gracilis* and *A. germaniana* have olivaceous costules and veins on the adaxial surface.

In Jamaica *A. heteroclita* probably hybridizes with *A. gracilis* (*Maxon & Killip 1472*) and *A. germaniana*; for instance, the specimen *Maxon & Killip 1266*, is a large plant collected in the road from Silver Hill Gap to Hardwar Gap with intermediate characters between *A. heteroclita* and *A. germaniana*.

6. *Amauropelta oligocarpa* (Humb. & Bonpl. ex Willd.) Pic. Serm. var. ***oligocarpa***, Webbia 31: 251. 1977. *Polypodium oligocarpum* Humb. & Bonpl. ex Willd., Sp. Pl., ed. 4 [Willdenow] 5: 201. 1810. *Aspidium oligocarpum* (Humb. & Bonpl. ex Willd.) Kunth, Nov. Gen. Sp. [H.B.K.] 1: 13.1815. *Nephrodium oligocarpum* (Humb. & Bonpl. ex Willd.) Desvaux, Mém. Soc. Linn. Paris 6: 256. 1827. *Aspidium oligocarpum* (Humb. & Bonpl. ex Willd.) Mett., Abh. Senckenberg. Naturf. Ges. 77. 1858 (*non* (Humb. & Bonpl. ex Willd.) Kunth 1816) *nom. illeg. Lastrea oligocarpa* (Humb. & Bonpl. ex Willd.) T. Moore, Index Fil. (T. Moore) 86. 1858. *Dryopteris oligocarpa* (Humb. & Bonpl. ex Willd.) Kuntze, Revis. Gen. Pl. 3: 378. 1898. *Dryopteris oligophlebia* (Humb. & Bonpl. ex Willd.) C.Chr., Index Filic. 280. 1905. *Thelypteris oligocarpa* (Humb. & Bonpl. ex Willd.) Ching, Bull. Fan Mem. Inst. Biol. Bot. 10: 253. 1941.—Type. VENEZUELA, **Sucre**: Cumaná, *Humboldt 441* (holotype: ?; isotype: B [digital photo!]).

Amauropelta oligocarpa is diagnosed by the presence of both uncinate and acicular hairs on the laminar tissue abaxially, transparent and/or yellowish globular glands on adaxial laminar tissue and vascular parts, long and robust hairs interspersed with short acicular hairs in adaxial costules and veins (Figure 21C, D), and laminae abruptly reduced proximally with up to 6 pairs of reduced proximal pinnae. However, this species is greatly variable in hair type and density on its axes. In Caribbean individuals, the typical uncinate hairs that characterized sect. *Uncinella* are found together with a whole array of different hair types, which include short-acicular, robust and sharp pointed long-acicular, long-ciliform, and/or many-septate multicellular hairs. Hair density varies from almost glabrescent to densely pubescent and almost lanate. This variability in pubescence is less conspicuous in continental tropical American individuals. There are at least three distinct forms and two of them are recognized here as varieties.

A group of distinctive specimens have distal rachises and abaxial costae sparsely to densely cover by long (to 2 mm), multicellular hairs, with 4-5 septae per hair. These characteristics appear more frequently in Puerto Rican and South American individuals which I identify as part of the variety *navarrensis.* In South American floras this variety has been treated at the species level as *Thelypteris navarrensis.*

Key to the varieties of *Amauropelta oligocarpa*

1. Abaxial costae densely covered by long septate hairs, 4-5 cells per hair ....
.... 6b. *A. oligocarpa* var. *navarrensis*
1. Abaxial costae lacking long septate hairs, or if multicellular hairs present, with no more than 3 cells per hair .... 6a. *A. oligocarpa* var. *oligocarpa*

6a. *Amauropelta oligocarpa* (Humb. & Bonpl. ex Willd.) Pic. Serm. var. ***oligocarpa***

Polypodium consanguineum Klotzsch, Linnaea 20: 387. 1847. *Polypodium oligosorum* Klotzsch, Linnaea 20: 387, 388. 1847.—Type. VENEZUELA, **Aragua**: "Colonia Tovar Columbiae", *Moritz 41 et 114 bis.* (holotype: B [digital photo!]).

Dryopteris columbiana C.Chr., Kongel. Danske Vidensk. Selsk. Skr., Naturvidensk. Math. Afd., ser. 7, 4: 279. *f. 8.* 1907. *Lastrea columbiana* (C.Chr.) Copel., Gen. Fil. (Ann. Cryptog. Phytopathol. 5) 138. 1947. *Thelypteris columbiana* (C.Chr.) C.V. Morton, Leafl. W. Bot. 8: 194. 1957.—Type. COLOMBIA, **Magdalena**: Santa Marta, *Smith 998* (holotype: P [digital photo!]; isotypes: P [digital photo!], U, UC, US [fragment!]).

Rhizomes erect, 1.05-1.93 cm in diameter, numerous scales at apices; *scales* 1.5-8 mm long, 0.25-1.5 mm wide, light brown, lustrous to matte, linear-lanceolate to lanceolate, long-acuminate at apices, subclathrate, somewhat densely pubescent, hairs acicular and uncinate, to 0.12 mm long, eglandular. *Leaves* monomorphic, with main axis adaxially sulcate, ascending in fascicles, 55.52-59.56 cm long. *Petioles* 13.43-17.64 cm long, 1.6-2.7 mm in diameter, dark brown to dark olivaceous, densely hirsute on all sides, with hairs to 0.2 mm long, or sparsely pubescent with long and robust hairs, 0.5-1 mm long, or with a dense mixture of short and long hairs, all hairs acicular, patent to slightly curved, mostly eglandular or occasionally with hyaline capitate hairs, < 0.05 mm long, with some sparse scales similar to those of rhizomes, but usually smaller. *Rachises* dark to light olivaceous, sometimes stramineous, densely pubescent on all sides, with hairs to 0.2 mm long, sparsely mixed with longer hairs, to 0.8 mm long, or densely pubescent, almost lanate, with long and robust hairs, 0.5-1 mm long, all hairs acicular and/or ciliform, patent to slightly curved, the robust acicular hairs sometimes bicellular, the proximal cells being shorter than the distal cells, densely covered with hyaline capitate hairs, < 0.05 mm long, or eglandular, scales lacking or bearing up to 3 in the whole axis. *Laminae* pinnate-pinnatifid, thin and herbaceous, 41.92-42.09 cm long, 11.19-11.51 cm wide, oblong-lanceolate, short attenuate at apices, abruptly reduced proximally, 3-6 pairs of reduced proximal pinnae, those oblong-pinnatifid to deltate-pinnatifid, most basal ones a mere auricle; *laminar tissue* densely pubescent on both sides, abaxial hairs uncinate and acicular, 0.1-0.3 mm long, patent, small capitate hairs also present, adaxial hairs acicular, mostly patent but sometimes somewhat appressed, hairs 0.1-0.3 mm long, longer hairs mainly at margins of segments, sparse to densely glandular above, glands (most of them broken in herbarium specimens) subsessile, globular, light-yellowish to transparent. *Pinnae* sessile, 4.94-7.53 cm long, 1.40-1.86 cm wide, 15-30 pairs, subopposite to alternate, oblong-lanceolate, short- to rarely long-acuminate at apices, with deep sinuses, proliferous bulbils absent; *aerophores* absent; *costae* adaxially sulcate, densely pubescent on both sides, abaxially with short acicular hairs, 0.06-0.2 mm long, and long and robust

hairs, 0.5-1 mm long, ciliform hairs also present sometimes, 0.2-0.8 mm long, with hyaline capitate hairs mainly at bases, adaxial hairs a mixture of short acicular and some uncinate, 0.1-0.2 mm long, ciliform, 0.5-0.8 mm long, and long and robust hairs, 0.5-1 mm long, with small hyaline capitate hairs and globular glands proximally, costal scales lacking; *segments* somewhat oblique, 0.18-0.26 cm wide, oblong, apices acute to obtuse, with margins somewhat revolute, entire to slightly crenate, basal segments enlarged; *costa-sinus distance* 0.2-0.8 mm; *costules* densely pubescent on both sides, abaxial hairs short acicular and uncinate, 0.1-0.2 mm long, and long and robust hairs, 0.5-0.8 mm long, adaxial hairs all long and robust, 0.7-1 mm long, eglandular; *veins* complanate on both sides, 6-11 pairs per segment, light to dark brown abaxially, simple, pubescent on both sides, abaxial hairs short acicular and uncinate, 0.1-0.2 mm long, somewhat dense, sparsely pubescent adaxially, but always with at least two acicular, long and robust hairs, 0.5-1 mm long per vein, eglandular. *Sori* round, submarginal on veins; *indusia* obscure, usually persistent, small, ear-like, light brown, sparsely hairy, bearing acicular hairs to 0.3 mm long, eglandular; *sporangia* glabrous. Figure 30.

General Distribution. Continental tropical America, from Mexico to Brazil, Ecuador to Argentina, and the Caribbean (Greater Antilles: Cuba, Hispaniola and Jamaica).

Distribution and Habitat in the Caribbean. Cuba; wet montane forests of the Sierra Maestra and Sierra de Nipe on the eastern side of island; at the edge of forests along trails, and on banks along water courses, partially shaded or in full sunlight in secondary forests. In Hispaniola, this species occurs in cloud forests in the Cordillera Central-Massif du Nord, Sierra de Neiba-Massif des Cahos, and Sierra de Baoruco-Massif de la Selle,

Figure 30. *Amauropelta oligocarpa* var. *oligocarpa*. Specimen (*Morton & Acuña 3800*, US).

along trails at edge of forests and understory of forests, partially to fully shaded banks, or exposed to full sunlight. In Jamaica, the species grows along the island in several parishes at high altitude wet montane forests and elfin woodland; (300-)600-2050 m.

ADDITIONAL SPECIMENS EXAMINED (Appendix B).

This variety, *A. oligocarpa* var. *oligocarpa*, probably hybridizes with *A. negligens* (*Moore s.n.* from Jamaica [GH]) from which it differs by the presence of long and robust acicular hairs that highly contrast with the short acicular hairs interspersed on adaxial costules and veins, lack of aerophores on abaxial pinna bases, the occurrence of more or less equilateral pinnae in the laminae, 3-6 pairs of reduced proximal pinnae, and dark brown to stramineous petioles. *Amauropelta negligens* has more or less uniform strigulose pubescence on adaxial costules and veins, with short acicular hairs, clavate and obvious aerophores in abaxial pinna bases, inequilateral pinnae, with acroscopic segments larger than the basiscopic ones, up to three pairs of reduced proximal pinnae, and atropurpureous petioles.

6b. *Amauropelta oligocarpa* var. ***navarrensis*** (H.Christ) O. Alvarez, this dissertation, Chapter 3: 41. 2010. *Aspidium navarrense* H.Christ, Bull. Herb. Boissier, sér. 2, 6: 160. 1906. *Dryopteris navarrensis* (H.Christ) H.Christ, Bull. Herb. Boissier, sér. 2, 7: 262. 1907. *Dryopteris oligocarpa* var. *navarrensis* (H.Christ) C.Chr., Index Filic., Suppl. 1906-1912. 36. 1913. *Thelypteris navarrensis* (H.Christ) Proctor, Bull. Inst. Jamaica, Sci. Ser. 5: 61. 1953.

Amauropelta navarrensis (H.Christ) Pic. Serm., Webbia 31: 251. 1977.—Type. COSTA RICA, **Cartago**: Navarro, *Werckle s.n.* (holotype: P [digital photo!]; isotype: US!).

Dryopteris lomatosora Copel., Univ. Calif. Publ. Bot. 19: 298, *t. 54*. 1941. *Lastrea lomatosora* (Copel.) Copel., Gen. Fil. (Ann. Cryptog. Phytopathol. 5) 139. 1947. *Thelypteris lomatosora* (Copel.) C.F. Reed, Phytologia 17: 289. 1968.—Type. PERU, **Huanuco**: District Churubamba: Hacienda Mercedes, Poca Perga, *Mexia 8187* (holotype: UC; isotypes: GH!, MO, F).

Rhizomes erect, 1.09-2.08 cm in diameter, with numerous scales at apices; *scales* 3-5 mm long, 0.45-1.5 mm wide, light brown, lustrous to matte, linear to lanceolate, long-acuminate at apices, clathrate, densely pubescent, hairs mostly acicular, 0.12-0.3 mm long, some uncinate to 0.2 mm long, eglandular. *Leaves* monomorphic, with main axis adaxially sulcate, ascending in fascicles, 37.05-49.58 cm long. *Petioles* 10.11-11.31 cm long X1.4-2.4 mm in diameter, dark brown to dark olivaceous, densely hirsute on all sides, with short hairs to 0.2 mm long, interspersed with long and robust hairs, 0.5-1 mm long, all hairs acicular, patent to slightly curved, mostly eglandular or occasionally with hyaline capitate hairs, < 0.05 mm long, with sparse scales similar to those of rhizomes. *Rachises* dark to light olivaceous, sometimes stramineous, densely pubescent, almost lanate, with long multicellular hairs, 1.2-2 mm long, mainly distally, and with long and robust hairs, 0.5-1 mm long, all hairs acicular and/or ciliform, patent to slightly curved, somewhat densely covered with hyaline capitate hairs, < 0.05 mm long, bearing a few scales along the axis, the scales similar to those of rhizomes but smaller. *Laminae* pinnate-pinnatifid, thin and herbaceous, 26.94-38.27 cm long, 11.57-16.49 cm wide, oblong-lanceolate, long-attenuate at apices, abruptly reduced proximally, 3-5 pairs of reduced proximal pinnae, those oblong-pinnatifid to deltate-pinnatifid, most basal ones deltate-tripartite; *laminar tissue* densely pubescent on both sides, abaxial hairs uncinate and acicular, 0.1-0.3 mm long, patent, small capitate hairs also present, adaxial hairs acicular, mostly patent but sometimes somewhat appressed, hairs 0.1-0.3 mm long, longer hairs mainly at margins of segments, sparse to densely glandular above, glands (most of them broken in herbarium specimens) subsessile, globular, light-yellowish to transparent. *Pinnae* sessile, 5.17-13.47 cm long, 1.10-1.74 cm wide, 20-35 pairs, subopposite to alternate, oblong-lanceolate, long- to rarely short-acuminate at apices, with deep sinuses, proliferous bulbils absent; *aerophores* absent; *costae* adaxially sulcate, densely pubescent on both sides, below with long multicellular hairs, 1.2-2 mm long, short acicular hairs, 0.06-0.2 mm long, and long and robust hairs, 0.5-1 mm long, ciliform hairs also present sometimes, 0.2-0.8 mm long, with hyaline capitate hairs proximally, adaxial hairs a mixture of short acicular and some uncinate, 0.1-0.2 mm long, ciliform, 0.5-0.8 mm long, and long and robust hairs, 0.5-1 mm long, with small hyaline capitate hairs and globular glands proximally, costal scales lacking; *segments* somewhat oblique, 0.16-0.28 cm wide, oblong, apices acute to obtuse, with margins somewhat revolute, entire to crenate, basal segments reduced or else similar in size and shape to the remaining segments in the pinnae; *costa-sinus distance* 0.4-0.8 mm; *costules* densely pubescent on both sides, abaxial hairs short acicular and uncinate, 0.1-0.2 mm long, long multicellular, 1.2-2 mm long, and long and robust hairs, 0.5-0.8 mm long, adaxial hairs all long and robust, 0.7-1 mm long, eglandular; *veins* complanate on both sides, 6-11 pairs per segment, light to dark brown abaxially, simple, pubescent on both sides, abaxial hairs short acicular and uncinate, 0.1-0.2 mm long, and long multicellular, 1.2-2 mm long, somewhat dense, sparsely pubescent above, but always with at least two acicular, long and robust hairs, 0.5-1 mm long per vein, eglandular. *Sori* round, submarginal on veins; *indusia* obscure, usually persistent, small, ear-like shaped, light brown and sparsely hairy, or else small reniform, greenish and ciliate, hairs acicular to 0.3 mm long, eglandular; *sporangia* glabrous. Figure 31.

General Distribution. Continental tropical America from Costa Rica to Venezuela, Ecuador, Peru, and the Caribbean (Greater Antilles: Cuba, Hispaniola, Jamaica, and Puerto Rico).

Distribution and Habitat in the Caribbean. Cuba; wet montane forests in the massif of Sierra Maestra, in open banks along trails, in partial shade, or in more disturbed areas exposed to full sunlight. In Hispaniola, this species occurs in very humid forests in the southwestern part of the Cordillera Central, including the Massif de la Hotte in Haiti and the Sierra de Baoruco in Dominican Republic; the species grows on open banks, on trailside, and at the edge of forests, mostly exposed to sunlight or partial shade conditions. In Jamaica the species grows on rocky edges of forests and roadside banks in the Blue Mountains and Port Royal Mountains. All the specimens of *A. oligocarpa* examined from Puerto Rico belong to the variety *navarrensis*, which occurs in moist shaded to partly shaded roadside banks in the Cordillera Central; 430-1300 m.

ADDITIONAL SPECIMENS EXAMINED (Appendix B).

Figure 31. *Amauropelta oligocarpa* var. *navarrensis*. Specimen (*Proctor 39652*, NY).

7. ***Amauropelta intromissa*** (C.Chr.) O. Alvarez, this dissertation, Chapter 3: 39. 2010.

Dryopteris intromissa C.Chr., Kongl. Svenska Vetensk. Acad. Handl., ser. 3, 16: 22. *t. 4, f. 9-10.* 1937.—Type. HAITI, **Sud-Est**: Morne La Selle, Marigot, Jardins Bois-Pin, *Ekman H 10060* (holotype: S; isotypes: IJ!, US!).

Rhizomes creeping to suberect, somewhat massive, 1.98-2.61 cm in diameter, with numerous scales at apices; *scales* 8.0-10.5 mm long, 2.10 mm wide, castaneous, lustrous, linear, linear-lanceolate to lanceolate, broad proximally, long-acuminate at apices, clathrate, somewhat densely pubescent, hairs acicular and uncinate, patent and curved, 0.1-0.2 mm long, eglandular. *Leaves* monomorphic, with main axis adaxially sulcate, ascending in fascicles, apparently of slow growth, the apices still uncoiling after maturity of proximal pinnae, 68.66-76.33 cm long. *Petioles* 13.72-14.27 cm long, 2.8-3.1 mm in diameter, dark reddish to dark brown proximally, light brown to stramineous distally, sometimes atropurpureous, somewhat densely pubescent, hairs acicular, patent, 0.15-0.3 mm long, with hyaline capitate hairs, < 0.03 mm long, sparsely scaly, scales similar to those of rhizomes. *Rachises* light brown to stramineous, densely pubescent on all sides, hairs mostly acicular, somewhat appressed, silky, 0.1-0.2 mm long, many ciliform hairs also present, to 0.5 mm long, covered by capitate hairs with yellowish tips, to 0.08 mm long, with several scales sparsely distributed, scales similar to those of rhizomes. *Laminae* pinnate-pinnatifid, thin and herbaceous, 54.94-62.06 cm long, 19.43-20.32 cm wide, lanceolate, apices still uncoiling, gradually reduced proximally, 4 pairs of reduced proximal pinnae, the two most distal pairs oblong-pinnatifid, and two most basal pairs deltate-pinnatifid, the basal segments always enlarged; *laminar tissue* densely pubescent on both sides, abaxial hairs all uncinate, 0.2-0.3 mm long, patent, adaxial hairs all acicular, appressed, 0.1-0.2 mm long, longer hairs on margins of segments, to 0.4 mm long, with a few capitate hairs with yellowish tips abaxially, sparsely above with subsessile, globular, yellowish glands. *Pinnae* sessile, 9.08-10.93 cm long, 1.79-2.55 cm wide, 20-25 pairs, alternate, oblong-lanceolate, acuminate at apices, with deep sinuses, proliferous bulbils absent; *aerophores* present, reduced to a small, atropurpureous bump, pubescent and capitate glandular, easily overlooked; *costae* adaxially sulcate, densely pubescent on both sides, abaxial hairs acicular and ciliform, 0.1-0.5 mm long, patent to rarely appressed, adaxial hairs acicular and ciliform, appressed to patent, 0.3-0.5 mm long, with capitate hairs with yellowish tips present on both sides, costal scales lacking; *segments* oblique, 0.33-0.38 cm wide, oblong, apices acute, with margins somewhat revolute and slightly crenate, basal segments elongated, with a small auricle at bases, sometimes overlapping the rachises; *costa-sinus distance* 0.7-1.05 mm; *costules* somewhat densely pubescent on both sides, abaxial hairs all acicular, 0.2-0.3 mm long, somewhat appressed to patent, adaxial hairs acicular and ciliform, appressed, 0.2-0.4 mm long, with few capitate hairs similar to those of the rachises; *veins* complanate on both sides, 8-10 pairs per segment, dark green to brown abaxially, simple, sparsely to densely pubescent on both sides, abaxial hairs mostly acicular, some uncinate, 0.2-0.3 mm long, patent, adaxial hairs acicular and ciliform, appressed, 0.14-0.4 mm long, sparsely capitate-glandular. *Sori* round, supramedial to submarginal on veins; *indusia* obscure, deciduous or persistent, small, ear-like shaped, light brown, densely pubescent, bearing uncinate hairs 0.2-0.3 mm long, eglandular; *sporangia* glabrous. Figure 32.

Figure 32. *Amauropelta intromissa*. Specimen (*Ekman H10060*, isotype, US).

General Distribution. Endemic to the Caribbean (Greater Antilles: Hispaniola).

Distribution and Habitat in the Caribbean. Haiti; forests in Massif de la Selle, in thickets; 1900 m.

Amauropelta intromissa has not received any further revision since its description in 1937. I included this species with reservation because no specimen other than the type have been seen.

8. *Amauropelta negligens* (Jenman) O. Alvarez, this dissertation, Chapter 3: 40. 2010.

Nephrodium negligens Jenman, Bull. Bot. Dept. Jamaica, n.s. 3: 21. 1896. *Dryopteris negligens* (Jenman) C.Chr., Index Filic. 279. 1905. *Thelypteris negligens* (Jenman) Proctor, Amer. Fern. J. 71: 58. 1981.—Type. JAMAICA: 1891, *Jenman s.n.* (holotype: NY!).

Rhizomes erect, 1.90-3.59 cm in diameter, with numerous scales at apices; *scales* 1.8-4 mm long, 1-1.5 mm wide, castaneous to light brown, lustrous, deltate-lanceolate, short-acuminate at apices, subclathrate to clathrate, densely pubescent, hairs mostly acicular, 0.08-0.1 mm long, some uncinate to 0.1 mm long, eglandular. *Leaves* monomorphic, with main axis adaxially sulcate, ascending in fascicles, 21-36.61 cm long. *Petioles* 4.38-8.92 cm long, 0.79-1.6 mm in diameter, atropurpureous to light brownish, lustrous, glabrescent to sparsely pubescent, hairs all uncinate, apparently deciduous, to 0.2 mm long, patent, eglandular, sparsely scaly, scales similar to those of rhizomes. *Rachises* dark brown, somewhat densely pubescent, denser on adaxial sulci, bearing appressed acicular hairs, 0.1-0.4 mm long, elsewhere with uncinate hairs and some interspersed acicular ones, hairs 0.1-0.2 mm long, patent, eglandular. *Laminae* pinnate-pinnatifid, thin and herbaceous, 16.62-30.05 cm long, 5.41-9.54 cm wide, oblong-lanceolate, attenuate at apices, gradually reduced proximally to 3 pairs of reduced proximal pinnae, those oblong-pinnatifid, blunt at apices, with medium sinuses, most basal ones a rounded auricle; *laminar tissue* somewhat densely pubescent on both sides, abaxial hairs uncinate, 0.1-0.2 mm long, patent, adaxial hairs acicular, 0.1-0.2 mm long, somewhat to fully appressed, eglandular. *Pinnae* subpetiolate to sessile, 2.48-5.47 cm long, 1.04-1.49 cm wide, 9-15 pairs, alternate, oblong-lanceolate, blunt to bluntly acuminate at apices, with medium sinuses, proliferous bulbils absent; *aerophores* present, small, clavate, somewhat short elongated on reduced proximal pinnae, rugose; *costae* adaxially sulcate, sparsely to somewhat densely pubescent on both sides, abaxial hairs acicular and uncinate, 0.1-0.3 mm long, patent, adaxial hairs all acicular, 0.1-0.3 mm long, appressed along margins of adaxial sulci, eglandular, costal scales lacking; *segments* somewhat oblique except for basal acroscopic ones, 0.27-0.42 cm wide, oblong, apices obtuse to truncate, with margins entire to slightly crenate, somewhat inequilateral, the acroscopic segments larger than the basiscopic ones, basal segments different, with basal acroscopic segments enlarged and basal basiscopic segments reduced; *costa-sinus distance* 0.6-1.2 mm; *costules* sparsely pubescent on both sides, abaxial hairs mostly uncinate, 0.1-0.2 mm long, patent, adaxial hairs all acicular, 0.1-0.2 mm long, appressed, eglandular; *veins* complanate on both sides, 4-7 pairs per segment, dark brown abaxially, simple, sparsely pubescent on both sides, abaxial hairs mostly uncinate, 0.1-0.2 mm long, patent, adaxial hairs all acicular, 0.1-0.2 mm long, appressed, eglandular. *Sori* round, supramedial to submarginal on veins; *indusia* absent; *sporangia* glabrous. Figure 33.

General Distribution. Endemic to the Caribbean (Greater Antilles: Jamaica).

Distribution and Habitat in the Caribbean. Jamaica; cloud forests near Hardwar Gap, Blue Mountain range, edge of trails; 1000-1070 m.

ADDITIONAL SPECIMENS EXAMINED (Appendix B).

Amauropelta negligens apparently is extremely rare in nature; certainly it is rarely collected. This species is a very local endemic and I saw only two specimens. One of those two was a potential hybrid with *A. oligocarpa* (*Moore s.n.* from Jamaica in 1858 [GH]). Many more collections are needed to better understand this species and its conservation status. *Amauropelta negligens*, however, differs from *A. oligocarpa* in numerous characters, most of them discussed under the latter species (No. 6a).

9. *Amauropelta germaniana* (Fée) O. Alvarez, this dissertation, Chapter 3: 37. 2010.

Phegopteris germaniana Fée, Mém. Foug., 11. Hist. Foug. Antil. 55, *t. 13, f. 2*. 1866. *Polypodium germanianum* (Fée) Baker, Syn. Fil. (Hooker & Baker) 306. 1867. *Dryopteris germaniana* (Fée) C.Chr., Index Filic. 267. 1905. *Lastrea germaniana* (Fée) Copel., Gen. Fil. (Ann. Cryptog. Phytopathol. 5) 139. 1947. *Thelypteris germaniana* (Fée) Proctor, Rhodora 61: 306. 1960.—Type. GUADELOUPE: 1861, *L'Herminier s.n.* (holotype: P [digital photo!]; isotypes: BM, P [digital photo!]).

Figure 33. *Amauropelta negligens*. Specimen (*Gastony 73*, GH).

Nephrodium nimbatum Jenman, Gard. Chron., ser. 3, 15: 264. 1894 [or] Bull. Bot. Dept. Jamaica, n.s. 3: 67. 1896. *Dryopteris nimbata* (Jenman) C.Chr., Index Filic. 279. 1905. *Dryopteris rustica* var. *nimbata* (Jenman) C.Chr., Kongel. Danske Vidensk. Selsk. Skr., Naturvidensk. Math. Afd., ser. 7, 10: 141. 1913.—Type. JAMAICA, **St. Thomas**: From Moody's Gap, *Jenman 2* (lectotype chosen by Christensen 1913: 141: K).

Rhizomes creeping, suberect or erect, sometimes trunk-like, 0.5-1.86 cm in diameter, apices mucilaginous in some individuals, but generally with numerous scales at apices; *scales* 4-13.5 mm long, 2-4.2 mm wide, light brownish to castaneous, somewhat translucent, lustrous, ovate-lanceolate to deltate-lanceolate, long-acuminate at apices, clathrate, somewhat densely pubescent, hairs mostly acicular, some uncinate to 0.16 mm long, eglandular. *Leaves* monomorphic, with main axis adaxially sulcate to tetrasulcate, ascending in fascicles, 25.79-132.2 cm long. *Petioles* 2.01-13.63 cm long, 1.3-4.3 mm in diameter, dark reddish to dark brown proximally, olivaceous to stramineous distally, somewhat densely pubescent, hairs short uncinate, 0.1-0.2 mm long, patent, eglandular, sparsely to densely scaly, scales similar to those of rhizomes but smaller, to 7 mm long, many fully appressed. *Rachises* olivaceous to stramineous, densely pubescent on all sides, hairs mostly uncinate abaxially, acicular and uncinate adaxially, hairs 0.1-0.3 mm long, patent, strigulose on sulci, eglandular, scaly to the distal eight pairs of reduced proximal pinnae, scales small, to 4 mm long, sometimes absent, lightly appressed when present, translucent and matte, or castaneous and lustrous, clathrate, pubescent and eglandular. *Laminae* pinnate-pinnatifid, thin and herbaceous, 17.09-121.13 cm long, 9.26-32.26 cm wide, oblong-lanceolate, acuminate at apices, abruptly reduced proximally, 6-13 pairs of reduced proximal pinnae, those deltate-oblong, tetra or penta partite, with central segments enlarged and outstanding, most basal ones reduced to a deltate segment with a large aerophore; *laminar tissue* densely pubescent on both sides, abaxial hairs all uncinate, 0.1-0.2 mm long, patent, adaxial hairs all acicular, 0.1-0.16 mm long, fully appressed, eglandular. *Pinnae* subpetiolate to sessile, 4.62-15.97 cm long, 1.10-2.56 cm wide, 25-30 pairs, alternate, oblong-lanceolate, acuminate at apices, with medium sinuses, proliferous bulbils not always present in acroscopic axils on adaxial side of distal pinnae, when present, covered by scales and short uncinate hairs; *aerophores* present, elongated to 2 mm long, flat, long-deltate, or somewhat cylindrical, sometimes coiled, blackish, with short uncinate hairs; *costae* adaxially sulcate, densely pubescent on both sides, abaxial hairs all uncinate, 0.1-0.3 mm long, patent, adaxial hairs all acicular, 0.1-0.3 mm long, appressed, eglandular, costal scales lacking; *segments* somewhat transverse, 0.25-0.59 cm wide, oblong, apices acute, apiculate or crenate, with margins somewhat revolute and slightly crenate, basal segments elongated or same size as the rest, with a small auricle at bases; *costa-sinus distance* 1.4-2.25 mm; *costules* somewhat densely pubescent on both sides, abaxial hairs all uncinate, 0.1-0.2 mm long, patent, adaxial hairs all acicular, 0.1-0.2 mm long, appressed, eglandular; *veins* complanate on both sides, 7-12(-13) pairs per segment, dark olivaceous abaxially, mostly simple, bifurcate only on basal segments, sparsely pubescent on both sides, abaxial hairs all uncinate, 0.1-0.16 mm long, patent, adaxial hairs all acicular, 0.1-0.2 mm long, appressed, eglandular. *Sori* round or elliptical, supramedial to submarginal on veins; *indusia* obscure, deciduous or persistent, when present, small, reniform to erect, light green, sparsely ciliate, bearing uncinate hairs, 0.12-0.2 mm long, eglandular; *sporangia* glabrous. Figure 34.

General Distribution. Continental tropical America from Costa Rica to Venezuela, and the Caribbean (Greater Antilles: Cuba, Hispaniola, Jamaica, and Puerto Rico; Lesser Antilles: Montserrat, Guadeloupe, Dominica, Martinique, and St. Vincent).

Distribution and Habitat in the Caribbean. Cuba; wet montane and submontane forests in the massifs of Sierra Maestra and Sierra del Purial in eastern Cuba. The species grows in rocky banks in streams, understory and edge of forests, in partially to fully shaded conditions and occurs in the massif of El Escambray at the center of the island. In Hispaniola, it occurs in cloud forests in the Cordillera Central-Massif du Nord, Sierra de Neiba-Massif des Cahos, and Sierra de Baoruco-Massif de la Selle, along trails at edge of forests and understory of forests, on partially to fully shaded banks, or exposed to full sunlight. In Jamaica, the species is rarer and is only known from the vicinity of Moody's Gap (Proctor 1985a). However, on a recent trip to Jamaica, George Proctor and I revisited the locality again and the plant was not found. In Puerto Rico, it occurs in mossy boulders near streams, and on moist roadside banks at the edge of forests in the Sierra de Luquillo and the Cordillera Central. The species also occurs in the Lesser Antilles islands of Montserrat, Guadeloupe, Dominica, Martinique, and St. Vincent in moist forests on limestone and mossy elfin woodlands, and along trails and roadsides in mesic areas 200-1250 m.

ADDITIONAL SPECIMENS EXAMINED (Appendix B).

Figure 34. *Amauropelta germaniana*. Specimen (*Maxon 4059*, US).

Amauropelta germaniana is a difficult species, which can be confused with *A. linkiana*, *A. heteroclita* and *A. rustica* and which also has considerable morphological diversity that is correlated with geographic origin. Central American, Lesser Antillean, and Jamaican specimens have obvious persistent indusia, which are light green. They also have obvious elongate aerophores at abaxial pinna bases, and proliferous bulbils in acroscopic axils on adaxial side of distal pinnae. These characters are absent, or nearly so, in the Cuban, Hispaniolan, and Puerto Rican specimens. I have made here no attempt to separate the different morphs; however, I expect that additional collecting and study will lead to the better understanding of this species, or to recognition of more taxa.

Large individuals from Cuba and Hispaniola can be misidentified to as *A. heteroclita*; the differences between these two species are discussed under *A. heteroclita* (No. 5). On the other hand, immature individuals from the Lesser Antilles have been referred as *A. linkiana*, from which it differs in numerous characters discussed under the former species (No. 2). From *A. rustica*, the Lesser Antillean *A. germaniana* differs by having proliferous bulbils in acroscopic axils on adaxial side of distal pinnae, scales present below the middle of the rachises, never above, and by lacking long uncinate hairs, > 0.5 mm long, on petioles, rachises and costae abaxially. *Amauropelta rustica* lacks proliferous bulbils on the laminae, has rachises densely and completely covered by cymbiform scales, and long uncinate hairs, 0.5-0.7 mm long, on rachises and costae abaxially.

10. *Amauropelta inabonensis* (Proctor) O. Alvarez, this dissertation, Chapter 3: 39. 2010. *Thelypteris inabonensis* Proctor, Amer. Fern J. 75: 61. 1985.—Type. PUERTO RICO, **Ponce**: Cordillera Central, Toro Negro State Forest, along headwaters of Río Inabón above high falls, *Proctor 40069* (holotype: US!; isotypes: IJ!, SJ).

Rhizomes erect, 1.42-2.15 cm in diameter, bearing numerous scales at apices; *scales* 2.7-5 mm long, 0.3-0.66 mm wide, light brown, lustrous, linear-lanceolate, with margins denticulate, filiform at apices, subclathrate, sparsely to densely pubescent, hairs all acicular to 0.1 mm long, patent, eglandular. *Leaves* monomorphic, with main axis adaxially sulcate, ascending in fascicles, 32.88-39.67 cm long. *Petioles* 4.03-5.33 cm long, 1.8-2.1 mm in diameter, dark olivaceous proximally, light brown to olivaceous distally, densely pubescent, hairs mostly acicular, uncinate hairs rarely present, hairs 0.12-0.5 mm long, patent, eglandular; *petioles* densely covered by numerous scales similar to those of rhizomes. *Rachises* light brown to olivaceous, densely pubescent on all sides, hairs short and long acicular, some robust and biseptate, also ciliform, hairs 0.14-1 mm long, longer hairs interspersed within shorter ones, patent, eglandular, densely covered by numerous scales similar to those of rhizomes. *Laminae* pinnate-pinnatifid, thick and coriaceous, 28.85-39.67 cm long, 8.19-8.93 cm wide, narrowly oblong-lanceolate, acuminate at apices, gradually reduced proximally, 8-11 pairs of reduced proximal pinnae, those deltate to ovate-pinnatifid, with apices acute to truncate; *laminar tissue* densely pubescent on both sides, abaxial hairs mostly acicular, a few uncinate, 0.08-0.16 mm long, patent, adaxial hairs all acicular, 0.1-0.3 mm long, mostly appressed and some patent, eglandular. *Pinnae* sessile, 4.15-4.36 cm long, 1.24-1.39 cm wide, 25-30 pairs, subopposite to alternate, oblong-lanceolate, acute to short-acuminate at apices, with medium and deep sinuses, proliferous bulbils absent; *aerophores* present, small, auriculiform, blackish and pubescent, hairs all acicular to 0.1 mm long; *costae* adaxially sulcate, densely pubescent on both sides, abaxial hairs mostly acicular, robust, ciliform and uncinate hairs also present, 0.2-0.5 mm long, all patent or slightly appressed, adaxial hairs all acicular, many robust and biseptate, these 0.2-0.7 mm long, appressed along the adaxial sulci, eglandular, abaxial side sparsely scaly, scales very small to 0.6 mm long, 1 cell wide, light brown, lustrous, narrowly linear, clathrate, with a few acicular hairs, and eglandular; *segments* oblique, 0.26-0.33 cm wide, oblong, apices acute to apiculate, with margins revolute and slightly crenate, basal segments slightly elongated, the basal acroscopic ones arcuate overlapping the rachises; *costa-sinus distance* 1.45-1.85 mm; *costules* somewhat densely pubescent on both sides, abaxial hairs mostly acicular, a few uncinate, 0.1-0.35 mm long, patent, adaxial hairs all acicular, unicellular robust hairs also present, hairs 0.2-0.4 mm long, patent and appressed, eglandular; *veins* complanate on both sides, 6-8 pairs per segment, light olivaceous to dark brown abaxially, simple, somewhat densely pubescent on both sides, abaxial hairs all acicular, 0.1-0.2 mm long, patent, adaxial hairs all acicular, 0.12-0.4 mm long, patent and appressed, eglandular. *Sori* round, supramedial to submarginal on veins; *indusia* obvious, persistent, reniform, small, light brown, densely ciliate, with a few hairs emerging from the center, hairs mainly acicular, some uncinate, 0.2-0.3 mm long, eglandular; *sporangia* glabrous. Figure 35.

General Distribution. Endemic to the Caribbean (Greater Antilles: Puerto Rico).

Distribution and Habitat in the Caribbean. Puerto Rico; wet mountain forests in Cordillera Central along Río Inabón, Toro Negro State Forest. The species grows on steep shaded banks along water courses; 1150-1250 m.

ADDITIONAL SPECIMENS EXAMINED (Appendix B).

Proctor (1985b), compared *A. inabonensis* (Figure 22A, B) to the Lesser Antillean *A. rustica* (Figure 22C and Figure 36), from which differs by its rhizomes suberect to erect, leaves always fasciculate, scales linear with entire margins and pubescent, hairs on rachises and costae abaxially long acicular to 1 mm long, sori supramedial to submarginal on veins, and small auriculate, blackish, and acicular setose aerophores at abaxial pinna bases,. *Amauropelta rustica* has long-creeping rhizomes, leaves distant to one another to exceptionally fasciculate, scales cymbiform with erose margins and lacking trichomes, hairs on rachises and costae abaxially long uncinate, 0.5-0.7 mm long, sori pericostal to inframedial on veins, and deltate-elongate, dark brown, and uncinate setose aerophores at abaxial pinna bases.

Proctor also compared *A. inabonensis* to the South American *A. funckii* and *A. frigida* (Proctor 1985b). From *A. funckii* (Figure 22D) it differs by its setulose scales, abaxial costae lacking long scales similar to those of the rachises, small and long-ciliate indusia, and broader laminae; *A. funckii* has glabrous scales which also cover the abaxial side of costae, large indusia that are minutely glandular and lacking hairs, and narrow laminae. On the other hand, *A. inabonensis* differs from *A. frigida* by its setulose scales and ciliate indusia, the absence of long multicellular hairs in rachises, and densely

Figure 35. *Amauropelta inabonensis*. Specimen (*Axelrod & Chavez 4312*, NY).

Figure 36. *Amauropelta rustica*. Specimen (*Hodge & Hodge 2805*, US).

strigulose laminar tissue adaxially. *Amauropelta frigida* has glabrous scales and indusia, long multicellular hairs in rachises, and sparsely strigulose laminar tissue adaxially.

Amauropelta inabonensis is a rare and probably endangered species and its conservation status is currently under study by the Fish and Wildlife Service of the U.S. Department of Interior (Section 4[f] of the Endangered Species Act, 16 U.S.C. 1533[f]). At present, the species' habitat is protected.

11. *Amauropelta rustica* (Fée) O. Alvarez, this dissertation, Chapter 3: 44. 2010.

Phegopteris rustica Fée, Mém. Foug., 11. Hist. Foug. Antil. 55, *t. 13, f. 1.* 1866. *Polypodium rusticum* (Fée) Baker, Syn. Fil. (Hooker & Baker) 306. 1867. *Dryopteris rustica* (Fée) C.Chr., Index Filic. 290. 1905. *Thelypteris rustica* (Fée) Proctor, Rhodora 61: 306. 1959[1960].—Type. GUADELOUPE: From Ravine la Rose de Matèliane, 1861, *L'Herminier s.n.* (holotype: ?, not found at P).

Dryopteris dominicensis C.Chr., Smithsonian Misc. Collect. 52: 384. 1909.—Type. DOMINICA: From Mount Diablotin, *Lloyd 987* (holotype: US!).

Rhizomes long-creeping to suberect, 0.72-1.32 cm in diameter, bearing numerous scales at apices; *scales* 2.5-6 mm long, 0.6-1 mm wide, castaneous, lustrous, cymbiform with margins erose, somewhat curled, apices attenuate to coiled, subclathrate and glabrous. *Leaves* monomorphic, with main axis adaxially sulcate, distant to one another to somewhat fasciculate, 21.33-93.61 cm long. *Petioles* 1.3-10.5 cm long, 2.1-6.17 mm in diameter, dark brown proximally, light brown to stramineous distally, lacking hairs or with few long uncinate hairs, 0.4-0.7 mm long, patent, eglandular, densely covered by numerous scales, the proximal ones similar to those of rhizomes, the distal ones smaller. *Rachises* light brown to stramineous, densely pubescent on all sides, hairs long acicular and ciliform adaxially, abaxially all long uncinate, hairs 0.5-0.7 mm long, patent, eglandular, densely covered by numerous scales similar to those of rhizomes and petioles. *Laminae* pinnate-pinnatifid, thick and coriaceous, 17.07-83.34 cm long, 0.23-21.86 cm wide, ovate, short-acuminate at apices, abruptly to gradually reduced proximally, (5-)6-8 pairs of reduced proximal pinnae, those ovate-pinnatifid with blunt to acute apices; *laminar tissue* somewhat densely pubescent on both sides, abaxial hairs all uncinate, 0.1-0.25 mm long, patent, adaxial hairs all acicular, 0.1-0.2(-0.3) mm long, fully appressed, eglandular. *Pinnae* subpetiolate to sessile, 5.23-14.73 cm long, 1.35-3.05 cm wide, 12-25 pairs, opposite to alternate, oblong-lanceolate to ovate-lanceolate, short-acuminate at apices, with medium sinuses, obviously carinate at sinuses, the false vein extends from sinuses almost to the costae, somewhat raised abaxially and pubescent, proliferous bulbils absent; *aerophores* present, deltate-elongated, somewhat bifid at apices, glabrescent or with few short uncinate hairs to 0.3 mm long; *costae* adaxially sulcate, densely pubescent on both sides, abaxial hairs all long uncinate, 0.34-0.7 mm long, patent, adaxial hairs acicular robust and ciliform, the latter flat and bicellular, hairs 0.4-0.6 mm long, appressed, eglandular, abaxial side covered with few small scales to 1 mm long, transparent to light castaneous, lustrous, linear-lanceolate, clathrate and glabrous; *segments* somewhat oblique, 0.26-0.67 cm wide, oblong, apices truncate, apiculate to obtuse, with margins somewhat revolute and slightly crenate, medial segments touching or overlapping those of adjacent pinnae, basal segments shorter than the rest and somewhat overlapping the rachises; *costa-sinus distance* 2-3.35 mm; *costules* densely pubescent on both sides, abaxial hairs all uncinate, 0.1-0.35 mm long, patent, adaxial hairs all acicular, 0.2-0.4 mm long, fully appressed, eglandular; *veins* complanate on both sides, 5-8 pairs per segment, dark brown abaxially, simple, sparsely pubescent on both sides, abaxial hairs all uncinate, 0.1-0.25 mm long, patent, adaxial hairs all acicular, 0.12-0.3 mm long, fully appressed, eglandular. *Sori* round, pericostal to inframedial on veins; *indusia* obvious, persistent, small, reniform, apparently folded or somewhat erect, light brown to greenish, densely pubescent, hairs all uncinate, 0.1-0.15 mm long, eglandular; *sporangia* glabrous. Figure 36.

General Distribution. Endemic to the Caribbean (Lesser Antilles: Guadeloupe, Dominica, Martinique, and St. Vincent).

Distribution and Habitat in the Caribbean. Guadeloupe, Dominica, Martinique, and St. Vincent; montane wet forests and elfin woodland, in ravines, at edge of forests and trails, in partially to fully shaded banks; 760-1400 m.

ADDITIONAL SPECIMENS EXAMINED (Appendix B).

The presence of a non-vascular, carinate ridge, also known as sinus keel, that extends from the sinuses between segments distal to the costae have been used to define the members of *Thelypteris* subg. *Steiropteris* (C.Chr.) Iwatsuki (Smith 1980). This character was believed to be absent in all amauropeltoid species, however, *A. rustica* has a similar keel between sinuses and costae, not previously reported, which constitutes a strong diagnostic character for this species within sect. *Uncinella*.

Amauropelta rustica is closely related to the Puerto Rican *A. inabonensis*, and has been often misidentified to as *A. germaniana*. The differences between *A. rustica* and these two species were discussed under *A. inabonensis* (No. 10) and *A. germaniana* (No. 9).

12. *Amauropelta hydrophila* (Fée) O. Alvarez, this dissertation, Chapter 3: 38. 2010.

Phegopteris hydrophila Fée, Mém. Foug., 11. Hist. Foug. Antil. 56, *t. 13, f. 3*. 1866. *Polypodium hydrophilum* (Fée) Baker, Ann. Bot. (Oxford) 5: 456. 1891. *Dryopteris hydrophila* (Fée) C.Chr., Index Filic. 271. 1905. *Thelypteris hydrophila* (Fée) Proctor, Rhodora 61: 306. 1959 [1960].—Type. GUADELOUPE: 1861, *L'Herminier s.n.* (holotype: ?, not found at P [photos from P deposited at GH!, NY!, US!]; isotypes: BM [photo deposited at MICH!], IJ!).

Rhizomes creeping to suberect, 0.91-2.98 cm in diameter, with numerous scales at apices; *scales* 1.8-2 mm long, 0.64-0.8 mm wide, light brown, matte, lanceolate, acuminate at apices, subclathrate, sparsely pubescent, hairs uncinate to 0.1 mm long, eglandular. *Leaves* monomorphic, with main axis adaxially sulcate, ascending in fascicles, 23.99-35.41 cm long. *Petioles* 5.28-10.01 cm long, 1.3-1.9 mm in diameter, atropurpureous to dark reddish proximally, matte, light brown to stramineous distally, pubescent only proximally, glabrescent distally, hairs mainly uncinate, some acicular interspersed within, hairs 0.1-0.2 mm long, patent, eglandular, sparsely scaly, scales similar to those of rhizomes. *Rachises* light brown to stramineous, densely pubescent on adaxial sulci, with acicular robust hairs, some uncinate and also ciliform, hairs 0.4-0.5 mm long, glabrescent below or sparsely pubescent with uncinate hairs, 0.1-0.2 mm long, eglandular, scales lacking. *Laminae* pinnate-pinnatifid, thin and herbaceous, 18.71-26.72 cm long, 5.85-7.26 cm wide, lanceolate, attenuate at apices, gradually reduced proximally, 2-3 pairs of reduced proximal pinnae, those lanceolate-pinnatifid to deltate-pinnatifid; *laminar tissue* essentially glabrous abaxially, if hairs present all uncinate, 0.1-0.15 mm long, patent, sparsely pubescent to glabrescent adaxially, adaxial hairs all acicular, 0.2-0.25 mm long, appressed, eglandular. *Pinnae* sessile, 3.69-4.6 cm long, 1.14-1.33 cm wide, 12-15 pairs, alternate, oblong-lanceolate, somewhat caudate at apices, with deep sinuses, proliferous bulbils absent; *aerophores* present, ligulate, more elongated at reduced proximal pinnae to 0.75 mm long, rugose and glabrous; *costae* adaxially sulcate, somewhat densely pubescent on both sides, abaxial hairs all uncinate, 0.12-0.2 mm long, patent or slightly appressed, adaxial hairs acicular, robust, 0.2-0.4 mm long, appressed along the margins of sulci, eglandular, costal scales lacking; *segments* oblique, 0.32-0.45 cm wide, oblong, apices apiculate to truncate, with margins revolute, entire or slightly crenate, basal segments similar in size and shape to the remaining segments in the pinnae; *costa-sinus distance* 0.8-1.5 mm; *costules* sparsely pubescent on both sides, abaxial hairs all uncinate, 0.1-0.16 mm long, patent or slightly appressed, adaxial hairs all acicular, 0.2-0.3 mm long, eglandular; *veins* complanate on both sides, 2-5 pairs per segment, blackish abaxially, simple, sparsely pubescent on both sides to glabrous abaxially, abaxial hairs all uncinate, 0.1-0.2 mm long, patent, adaxial hairs all acicular, hairs 0.2-0.25 mm long, fully appressed, eglandular. *Sori* round, medial on veins; *indusia* obvious, persistent, reniform, light brownish, ciliate to somewhat pubescent, bearing uncinate hairs to 0.16 mm long, eglandular; *sporangia* glabrous. Figure 37.

General Distribution. Endemic to the Caribbean (Lesser Antilles: Guadeloupe and Martinique).

Distribution and Habitat in the Caribbean. Guadeloupe and Martinique; epipetric on wet, dripping cliffs in wet montane forests, deeply shaded; if terrestrial, then present on humid and shady roadsides; 360-1050 m.

ADDITIONAL SPECIMENS EXAMINED (Appendix B).

Amauropelta hydrophila is a rare plant that has only been collected three times. It is likely highly threatened or extinct as indicated by the fact that it has not been collected in the last 50 years. The lack of more specimens in herbarium collections made almost impossible to fully understand this species, which has been confused with *A. antillana* (Figure 38), which is also rare. However, it differs from the latter by its obviously large and ligulate aerophores at abaxial pinna bases, by the presence of only uncinate hairs in abaxial laminae, very small, light castaneous, matte, and uncinate setulose scales which are < 2.5 mm long, small indusia with uncinate hairs only, lanceolate laminae, and with pinna apices short-acuminate. *Amauropelta antillana* lacks aerophores at abaxial pinna bases, or if present, very obscure, and has both uncinate and acicular hairs on laminae abaxially, golden brownish, lustrous, and glabrous (or if pubescent, acicular setulose), laminae ovate-lanceolate scales which are > 2.5 mm long, and with long-attenuate pinna apices. More over, each species occurs in different habitats: *Amauropelta hydrophila* is

Figure 37. *Amauropelta hydrophila*. Specimen (*Proctor 20151*, US).

mainly lithophytic, occurring in shaded ravines, or if terrestrial in mossy patches in montane woodland; *A. antillana* is a more xerophytic plant that occurs in exposed slopes and elfin woodlands. Many more collections are needed to better understand these species.

13. ***Amauropelta antillana*** (Proctor) O. Alvarez, this dissertation, Chapter 3: 33. 2010.

Thelypteris antillana Proctor, Rhodora 63: 33. 1961.—Type. ST. KITTS: Upper SW spur of Verchild's Mountain below Dodans Pond, *Proctor 19587* (holotype: A!; isotype: IJ!).

Rhizomes suberect, 1.29-1.93 cm in diameter, with numerous scales at apices; *scales* 2.97-9.45 mm long, 0.9-1.8 mm wide, golden brown, lustrous, lanceolate, attenuate at apices, subclathrate, sparsely pubescent, hairs acicular and uncinate to 0.1 mm long, eglandular. *Leaves* monomorphic, with main axis adaxially sulcate, ascending in fascicles, 19.78-51.69 cm long. *Petioles* 2.27-7.21 cm long, 0.7-2 mm in diameter, dark brown proximally, light brown to stramineous distally, sparsely to densely pubescent, hairs all acicular, 0.06-0.1 mm long, patent, with small hyaline capitate hairs present, < 0.05 mm long, sparse, with few scales proximally similar to those of rhizomes. *Rachises* light brown to stramineous, somewhat densely pubescent on both sides, denser on adaxial sulci, hairs mostly acicular, some uncinate interspersed within, 0.06-0.1 mm long, with numerous small hyaline capitate hairs, < 0.05 mm long, scales lacking. *Laminae* pinnate-pinnatifid, thick and coriaceous, 16.31-44.62 cm long, 7.23-15.31 cm wide, ovate-lanceolate to lanceolate, long-acuminate at apices, abruptly reduced proximally, 3-7 pairs of reduced proximal pinnae, those lanceolate-pinnatifid to deltate-pinnatifid, most basal ones an auricle; *laminar tissue* somewhat densely pubescent to glabrescent on both sides, sometimes only ciliate at margins, abaxial hairs mostly acicular, some uncinate, 0.1-0.25 mm long, patent, adaxial hairs all acicular, 0.1-0.25 mm long, patent and appressed, eglandular. *Pinnae* sessile, 4.04-8.17 cm long, 0.16-1.77 cm wide, 15-25 pairs, opposite to alternate, oblong-lanceolate to lanceolate, long-attenuate at apices, with medium sinuses, proliferous bulbils absent; *aerophores* mostly absent, if present, a small bump, verrucose and somewhat pubescent, that continues with the basal basiscopic costules; *costae* adaxially sulcate, densely pubescent on both sides, abaxial hairs mostly acicular, some uncinate, 0.08-0.3 mm long, patent, adaxial hairs all acicular, robust, 0.1-0.3 mm long, appressed, eglandular, costal scales lacking, or else very small to 0.1 mm long, 1 cell wide, clathrate and glabrous; *segments* oblique, 0.17-0.36 cm wide, oblong to deltoid, apices obtuse to acute, with margins strongly to somewhat revolute, slightly crenate, somewhat inequilateral at bases, the basal acroscopic segments elongated and overlapping those of adjacent pinnae, basal basiscopic ones smaller than the rest; *costa-sinus distance* 0.85-1.2 mm; *costules* sparsely pubescent to glabrescent on both sides, abaxial hairs mostly acicular, some uncinate, 0.06-0.3 mm long, patent, adaxial hairs all acicular, 0.1-0.3 mm long, appressed, eglandular; *veins* complanate on both sides, 5-9 pairs per segment, stramineous abaxially, simple, sparsely pubescent on both sides, abaxial hairs mostly acicular, some uncinate, 0.06-0.16 mm long, patent, adaxial hairs all acicular, 0.1-0.25 mm long, appressed, eglandular. *Sori* round, medial to submarginal on veins; *indusia* obvious, persistent, reniform, light brownish, densely ciliate, bearing uncinate but mostly acicular hairs, 0.1-0.25 mm long, minutely capitate glandular; *sporangia* glabrous. Figure 38.

General Distribution. Endemic to the Caribbean (Lesser Antilles: St. Kitts, Guadeloupe, and Dominica).

Distribution and Habitat in the Caribbean. St. Kitts, Guadeloupe, and Dominica; wet montane forests and elfin woodland, on exposed slopes, at the edge of forests and montane thickets, partial to full sunlight; 665-1100 m.

ADDITIONAL SPECIMENS EXAMINED (Appendix B).

Among the four specimens of *A. antillana* examined, three of them, *Hodge & Hodge 1857*, *Britton & Cowell 529*, and *Stehlé 2429*, have in common a glabrescent lamina abaxially, and a more or less absence of obvious uncinate hairs from indusia and abaxial laminae. These characteristics of the laminae contrast with the type specimen, *Proctor 19587*, which has obvious uncinate hairs in the more or less densely pubescent, laminae abaxially, as well as on the indusia. Further studies and many more collections are needed to better understand this species. See also discussion under *A. hydrophila* (No. 12).

Figure 38. *Amauropelta antillana*. Specimen (*Hodge & Hodge 1857*, GH).

14. ***Amauropelta scalaris*** (H.Christ) Á.Löve & D.Löve, Taxon 26: 325. 1977. *Aspidium scalare* H.Christ, Bull. Herb. Boissier, sér 2, 6: 159. 1906. *Dryopteris scalaris* (H.Christ) C.Chr., Kongel. Danske Vidensk. Selsk. Skr., Naturvidensk. Math. Afd., ser. 7, 4: 323, *f. 47*. 1907. *Lastrea scalaris* (H.Christ) Copel., Gen. Fil. (Ann. Cryptog. Phytopathol. 5) 140. 1947. *Thelypteris scalaris* (H.Christ) Alston, J. Wash. Acad. Sci. 48: 234. 1958.— Type. GUATEMALA, **Alta Verapaz**: Cubilquitz, *Tuerckheim 8357* (lectotype chosen by Christensen 1907: 324: P [digital photo!]; isolectotypes: B [digital photo!], GH, P [digital photo!], US!).

Rhizomes erect, 2.06-2.17 cm in diameter, with numerous scales at apices; *scales* 1.32-4 mm long, 0.6-1.5 mm wide, light brown, matte, deltate-lanceolate, attenuate at apices, sparsely to densely pubescent, hairs all acicular to 0.1 mm long, eglandular. *Leaves* monomorphic, with main axis adaxially sulcate, ascending in fascicles, 94.29 cm long. *Petioles* 5.18-13.36 cm long, 2-2.5 mm in diameter, light brown proximally, stramineous distally, densely pubescent, mainly at adaxial sulci, hairs mostly acicular, silky, patent to slightly curved, hairs 0.15-0.45 mm long, eglandular, sparsely scaly, scales similar to those of rhizomes. *Rachises* stramineous, somewhat densely pubescent, mainly at adaxial sulci, hairs uncinate and acicular, somewhat silky, hairs 0.1-0.4 mm long, patent to slightly curved, eglandular and lacking scales. *Laminae* pinnate-pinnatifid, thin and herbaceous, 80.93 cm long, 17.67-20.61 cm wide, oblong-lanceolate, attenuate at apices, gradually reduced proximally, 9-14 pairs of reduced proximal pinnae, those oblong-pinnatifid to mostly deltate-pinnatifid, most basal ones auriculiform; *laminar* *tissue* densely pubescent on both sides, abaxial hairs all uncinate, 0.08-0.2 mm long, patent, adaxial hairs all acicular, somewhat fully appressed, to 0.15 mm long, eglandular. *Pinnae* sessile, 8.77-10.24 cm long, 1.22-1.45 cm wide, 20-35 pairs, opposite to subopposite, oblong-lanceolate, long-acuminate at apices, with deep sinuses, proliferous bulbils absent; *aerophores* absent; *costae* adaxially sulcate, somewhat densely to sparsely pubescent abaxially, abaxial hairs mostly uncinate, patent, 0.1-0.4 mm long, densely pubescent adaxially, hairs all acicular, appressed, to 0.3 mm long, eglandular, costal scales lacking; *segments* somewhat oblique, 0.23-0.3 cm wide, oblong, apices acute, with margins entire to slightly crenate, basal segments somewhat enlarged; *costa-sinus distance* 0.4-0.8 mm; *costules* sparsely pubescent on both sides, abaxial hairs all uncinate, 0.08-0.16 mm long, patent, adaxial hairs all acicular, somewhat fully appressed, to 0.15 mm long, eglandular; *veins* complanate to somewhat sunken above, 7-11 pairs per segment, light to dark brown abaxially, simple, sparsely pubescent on both sides, abaxial hairs all uncinate, 0.08-0.16 mm long, patent, adaxial hairs all acicular, somewhat fully appressed, to 0.15 mm long, eglandular. *Sori* round, supramedial to submarginal on veins; *indusia* obscure, usually persistent, small, reniform, light brown to greenish, sparsely ciliate, hairs acicular to 0.2 mm long, eglandular; *sporangia* glabrous. Figure 39.

General Distribution. Continental tropical America from southern Mexico to Venezuela, Ecuador, Peru, and the Caribbean (Greater Antilles: Cuba).

Distribution and Habitat in the Caribbean. This species occurs in Cuba. Its distribution is very local and only three populations are known: one in the massif of the Sierra del Escambray at the center of the island, and two others in the massif of the Sierra del Purial in eastern Cuba.

ADDITIONAL SPECIMENS EXAMINED (Appendix B).

The only report for the existence of this species in the Caribbean is that of Sánchez and Caluff (2005) from Cuba. This species is rare in Cuba (Sánchez and Caluff pers. comm.); the eastern individuals are acidophilous, growing in pine forests, and those from the center of the island are calcicolous, growing in limestone outcrops.

Figure 39. *Amauropelta scalaris*. Specimen (*Sánchez & Cuesta 74292A*, BSC).

CHAPTER 6

FUTURE PROSPECTS

LIMITATIONS OF CURRENT WORK

Phylogenetics. The incorporation of modern concepts of monophyly in the analysis of genera and species within Thelypteridaceae has provided new insights that further our current understanding of the family and contribute to the establishment of an accepted worldwide classification system. The resulting phylogeny from this study supports the monophyly of *Amauropelta*. However, because of poor phylogenetic resolution and sampling, it was not possible to test the monophyly of the sections in *Amauropelta*, or to establish clear evolutionary relationships among the sections and species. Future studies in the group will need to focus on improving phylogenetic resolution by: 1) including more taxa that are representatives of all ten sections of *Amauropelta*, and 2) exploring additional molecular markers. These may well help to improve phylogenetic power and shed light on the evolutionary relationships of sections and species.

Although it is clear that phylogenetic resolution should be improved, the resulting phylogeny provides a framework for reconstructing the evolution of morphological traits. Such reconstructions may reveal potential synapomorphies that could provide insights to solve long-standing taxonomic questions regarding sectional classification in *Amauropelta* and species relationships.

Taxonomy. This study constitutes an updated revision of the Caribbean species of *Amauropelta* (this dissertation, Chapter 4). I also provide the most current list of the amauropeltoid species that occur on the island of Hispaniola after a 64-year gap since the latest revision (Christensen 1937). However, a rigorous sectional classification for these taxa, as well as for the rest of the genus, remains to be completed.

A taxonomic revision of sect. *Uncinella* has been produced (this dissertation, Chapter 5), which sets the foundation for a more ambitious regional monograph covering the ten sections of *Amauropelta* and all of its 57 Caribbean taxa. This is important because the production of *short* regional monographs constitute the most effective way to cover this large genus of about 200 species.

FUTURE DIRECTIONS

Taxonomy: It will be necessary to expand the molecular studies in the Thelypteridaceae to strengthen phylogenetic signals in a few nodes within the Amauropeltoid and Cyclosoroid clades. New studies are essential to establish a comprehensive classification system for Thelypteridaceae based on the phylogenetic relationships of its species.

Biogeography. The high levels of endemism observed in this study parallel the levels of endemism reported for various flowering plant taxa in the Caribbean region (Santiago-Valentin & Olmstead 2004; Francisco-Ortega & al. 2007) where over 50 % of the remarkably diverse Caribbean flora is endemic, making it one of Earth's biodiversity hotspots (Santiago-Valentin and Olmstead 2004). The cause of the high diversity and endemism of the Caribbean Islands has been generally attributed to many factors such as complex geology, tropical climate, and diverse topography resulting in exceptional habitat mosaics. However, few detailed studies of the origin of Caribbean biodiversity have been undertaken, and none using ferns as a study system. Animals and seed plants may not be representative of groups such as ferns because ferns have such different dispersal mechanisms. Therefore, it would be interesting to study biogeographic relationships among the Caribbean amauropeltoids.

The resulting phylogeny provides a framework for the reconstruction of historical biogeography of Caribbean *Amauropelta*. The phylogeny could be reconciled with the geological hypothesis for Caribbean area relationships (Figure 40), based upon the geological history of the Caribbean region by Iturralde-Vinent and MacPhee (1999), to identify vicariance or dispersal patterns responsible for the distribution of amauropeltoid species in the area. The results can be compared with those of other studies of Caribbean biogeography to address a major biogeographic question: What role did vicariance and dispersal play in speciation and endemism of the Caribbean biota? If vicariance has played a major role in the history of the group, the phylogenetic relationships of the biota should mirror the geo-historical relationships among the areas that these organisms have occupied. If not, dispersal will have to be considered a major factor in speciation.

Phylogeography. Phylogeographic studies can provide insight into the patterns of dispersal and gene flow in plants. In ferns, as in most plant groups, chloroplasts are maternally inherited (Gastony & Yatskievych 1992), which means that phylogeographic studies of amauropeltoid ferns using chloroplast markers can identify maternal lineages that will provide direct information about the direction of dispersal among the islands. Ultimately, phylogeographic studies within *Amauropelta* will contribute to a better understanding of the biogeographic relationships between the species and regions they occupy, e.g. Florida, Central and South America, the Caribbean Islands, Hawaii, Polynesia, Sri Lanka, Africa, Madagascar, and the Mascarene Islands, and potentially will uncover the relationships between the Caribbean species of the group and with those that occur elsewhere.

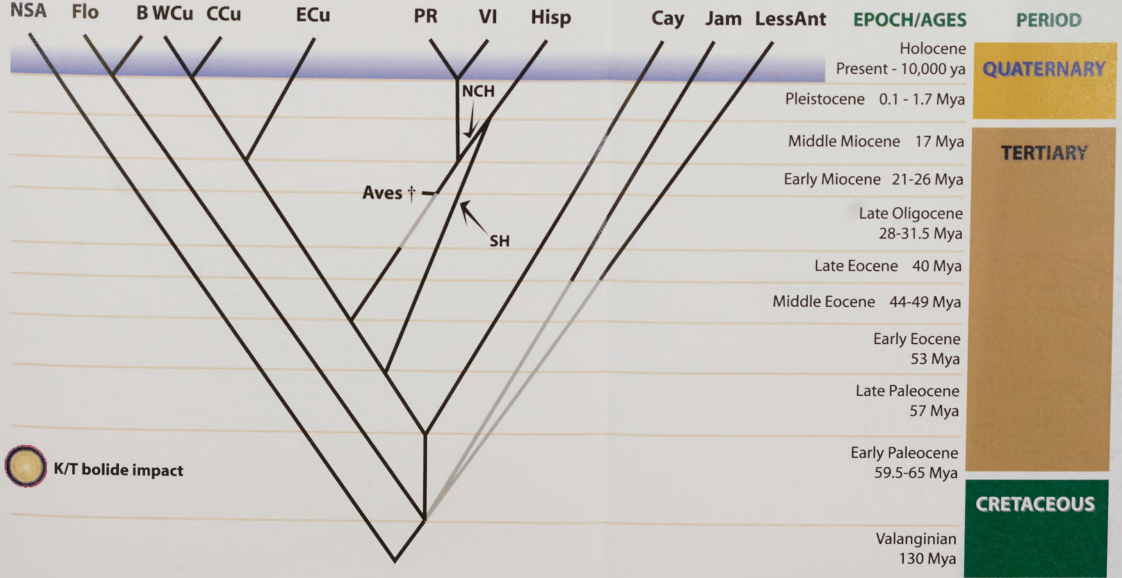
Studies on adaptive radiation. Fossil data show that Thelypteridaceae had a wide distribution during the Eocene, including the Neotropics (Collinson 2001), at the time when the islands of the Caribbean region started to emerge. Within the Thelypteridaceae, *Amauropelta* has the largest number of endemic species in the Caribbean and it is possible that species diversification occurred *in situ*, which make this group a good model to test if adaptive radiation has occurred. To explore further this hypothesis I will examine the evolution of selected characters to evaluate whether there was, in fact, a radiation and if so, whether the radiation is adaptive or non-adaptive; these preliminary studies will set the basis to explore which trait or suite of traits can be correlated with the performance of the plants and effective niche exploitation.

Conservation of biodiversity. I have a special interest in continuing to document the biodiversity of tropical ferns, especially those that occur in the Caribbean. Many ferns that occur in the area are narrow endemics in extremely fragile ecosystems that are under threat from habitat destruction. An example is *Amauropelta scalpturoides*, a Greater Antilles endemic species that mainly grows on acidic soil of pine groves and over serpentine-derived soils (Alvarez-Fuentes and Sánchez 2005b). My future research on systematics, biogeography, and evolution of these plants will target many organisms that are highly threatened.

Many endemic Caribbean ferns are potentially on the verge of extinction, threatened by habitat modification, restricted distribution, incorrect forest management practices, and hurricane damage. My future goals include the design of conservation strategies that effectively combine the biogeographic history of organisms and areas that they inhabit, with the phylogeny of the species under study.

There are multiple approaches that convey phylogenetic information with historical biogeography. One of these methods ranks priority of areas for conservation by generating indexes of biodiversity based on the uniqueness of the species, biogeographic information, and phylogenetic data (Crisci et al. 2003). These types of comprehensive analyses will allow us to redirect our conservation efforts towards the design of *in situ* conservation strategies that will target lineages and populations as the ultimate currency of biodiversity rather than as individual species.

Figure 40. Expected area relationship from the Caribbean beginning in the Early Cretaceous. NSA = North of South America, Flo = Florida (South of North America), B = Bahamas, WCu = Western Cuba, CCu = Central Cuba, ECu = Eastern Cuba, PR = Puerto Rico, VI = Virgin Islands, Hisp = Hispaniola, NCH = North Central Hispaniola, SH = South Hispaniola, Cay = Cayman Ridge, Jam = Jamaica, LessAnt = Lesser Antilles, Aves = Aves Ridge. Grey lines imply landmass formations. The icon on the left represents the timing of impact of the K/T bolide around 65 million years ago. The graphic illustrates the paleogeographic reconstruction of the Caribbean region given by Iturralde-Vinent and MacPhee (1999).


NSA
Flo
B
WCu
CCu
ECu
PR
VI
Hisp
Cay
Jam
LessAnt
EPOCH/AGES
PERIOD
Holocene
Present - 10,000 ya
QUATERNARY
Pleistocene 0.1 - 1.7 Mya
NCH
Middle Miocene 17 Mya
TERTIARY
Early Miocene 21-26 Mya
Aves †
Late Oligocene
28-31.5 Mya
SH
Late Eocene 40 Mya
Middle Eocene 44-49 Mya
Early Eocene
53 Mya
Late Paleocene
57 Mya
Early Paleocene
59.5-65 Mya
K/T bolide impact
CRETACEOUS
Valanginian
130 Mya

APPENDICES

APPENDIX A

Aligned sequences of Thelypteridaceae:
Chloroplast regions *rps4* + *rps4-trnS* spacer (1-965), and *trnL-trnF* spacer (966-1422)

Input data matrix:

```
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Taxon/Node                  12345678901234567890123456789012345678901234567890123456789012345678901234
----------------------------------------------------------------------------------------------------------
Cycl esqui  S C  ----------TGACCAGGTTTCACGGGTAGGGGTAAAACACCTAACTTGGGAGAATTTCGAGTTGGTTCCGATC
Cycl arida  S C  CTACNATATNTACCGGGG-TTCACGGGTAGGGGTAAAACACCTANCTTGGGAGAATTTCGAGTTGCTACCGATC
Cycl hispi  S C  --------------------------------------------------------------------------
Ch augesce  S C  ----------------------ACGGGTAAGGGTAAAACACCTAACTTGGGAGAATTTCGAGTTGCTACCGATC
Cycl inter  S C  --------------------------------------------------------------------------
Cycl griff  S C  ---------------------------------CTAAACACCCAACTTGGGAGAATCTCGAGTTGCTACCGATC
Gl erubesc  S C  ----------TACCAGGG-TTCACGGGTAGGGGTAAAACACCTAACTTGGGAGAATTTCGAGTTGCTACCGATC
Go poitean  S C  --------TTTACCCGGG-TTCCGGGGTAACGGTAAAACACCCAACTTGGGAGAATTTCGAGTTGCTACCGATC
Cycl totto  S C  ---------------------CACGGGTAAGGGTGAAACACCCAACTTGGGAGAATTTCGAGTTGCTACCGATC
Ma torresi  S C  ----------------------------------------------------GAATTTCGAGCTGCTACCGATC
Cycloso sp  S C  ----------------------------------------------TGGGCAGAATTTCGAGTTGCTACCGATC
Cycl crass  S C  ------------CC-GGG-TTC-CGGGTAAGGGTAAAAC-CCCAACTTGGGAGAATTTCGAGTTGCTACCGATC
Metat dayi  S C  -------------------------------GGTAAAACACCCAACTTGGGAGAATTTCGAGTTGCTACCGATC
Na aoristi  S C  ---------------------------TAGGGATAAAACACCTAACTTGGGAGAATTTCGAATTGGTACCGATC
The nevade  S C  -------ATTTACC-GGG-TTCACGGGTAAGGGTAAAACACCCAACTTGGGAGAATTTCGAGTTGCTACCGATC
Ph connect  S C  --------------------------------------------------------------------------
Ph decursi  S C  --------------------------------------------------------------------------
Pl archbol  S C  ---------------------------CAACTGTAAAACACCTAACTTGGGAGAATTTCGAGTCGCTACTGATC
Pn ecallos  S C  -------ATTTACCAGGG-TTCACGGGTAGGGGTAAAACACCTAGCTTGGGAGAATTTCGAGTTGGTACCGATC
Cycl simpl  S C  -------------------------------------------------------------GACGCTACCGATT
Psp aurita  S C  -------------------------------GGTAAAACATCCAACTTGGGAGAATTTCGAGTTGCTACCGATC
Sp pennige  S C  --------TTTACCAGGG-TCCACGGGTAGGGGTAAAACACCTAACTTGGGAGAATTTCGAGTTGGTACCGATC
Cycl taiwa  S C  ------GATTTACCAGGG-TTCACGGGTAGGGGTAAAACACCTAACTTGGGAGAATTTCGAGTTGGTACCGATC
St leprieu  S C  --------------------------------------------------------------------------
The palust  S C  --------------------------------------------------------------------------
Tr ciliata  S C  ------------------------AGCTACAGGTTAAACACCTAACTTGGGAGAATTTCGAGTTGGTACCGATC
```

```
Co seemann S C  -------------------------------------------------------------------A-CGATC
Cystopteri S C  --------------------------------------CACCCAACTTAGGAGAATTTCGAGTTACTACCGATC
Gymnocarpi S C  --------------------------------------------------------------TTACTACCGATC
Acystopter S C  --------TTTACCGGGG-TTCNCGGGTAAGGGTAAAACACCCAACTTAGGAGAATTTCGAGTTACTACCGATC
The oligoc S C  CTAAAGAATTTACCAGGG-TTCACGGGTAAGGGTAAAACACCCAACTTGGGAGAATTTCGAGTTGCTACCGATC
The resi01 OAF  --------------------TCACGGGTAAGGGTAAAACACCCAACTTGGGAGAATTTCGAGTTGCTACCGATC
The grac03 OAF  --------------------TCACGGGTAAGGGTAAAACACCCAACTTGGGAGAATTTCGAGTTGCTACCGAGC
The basi09 OAF  --------------------TCACGGGTAAGGGTAAAACACCCAACTTGGGAGAATTTCGAGTTGCTACCGATC
The glan12 OAF  --------------------TCACGGGTAAGGGTAAAACACCCAACTTGGGAGAATTTCGAGTTGCTACCGATC
The firm20 OAF  ----------------------------------------------------------------GCTACCGATC
The olig21 OAF  --------------------TCACGGGTAAGGGTAAAACACCCAACTTGGGAGAATTTCGAGTTGCTACCGATC
The cora19 OAF  ------------------------GGGTAAGGGTAAAACACCCAACTTGGGAGAATTTCGAGTTGCTACCGATC
The rudi11 OAF  --------------------------------------------------------------------------
The hete30 OAF  -------------------TTCACGGGTAAGGGTAAAACACCCAACTTGGGAGAATTTCGAGTTGCTACCGAGC
The glob56 OAF  ------------------------GGGTAAGGGTAAAACACCCAACTTGGGAGAATTTCGAGTTGCTACCGATC
The amph86 OAF  ------------------------------GGGTAAAACACCCAACTTGGGAGAATTTCGAGTTGCTACCGATC
The balb_L OAF  ------------------------GGGTAAGGGTAAAACACCCAACTTGGGAGAATTTCGAGTTGCTACCGATC
The balb_B OAF  ------------------------------GGGTAAAACACCCAACTTGGGAGAATTTCGAGTTGCTACCGATC
The cons73 OAF  ------------------------------GGGTAAAACACCCAACTTGGGAGAATTTCGAGTTGCTACCGATC
The germ_1 OAF  ------------------------GGGTAAGGGTAAAACACCCAACTTGGGAGAATTTCGAGTTGCTACCGATC
The inab61 OAF  ------------------------GGGTAAGGGTAAAACACCCAACTTGGGAGAATTTCGAGTTGCTACCGATC
The link59 OAF  --------------------------------------------------------------------------
The oppo82 OAF  -------------------TTCACGGGTAAGGGTAAAACACCCAACTTGGGAGAATTTCGAGTTGCTACCGATC
The rose36 OAF  -------------CCAGGG-TTCACGGGTAAGGGTAAAACACCCAACTTGGGAGAATTTCGAGTTGCTACCGATC
The rufa35 OAF  ------------------------------GGGTAAAACACCCAACTTGGGAGAATTTCGAGTTGCTACCGATC
The rust50 OAF  ------------------------------GGGTAAAACACCCAACTTGGGAGAATTTCGAGTTGCTACCGATC
The germ_2 OAF  ------------------------------GGGTAAAACACCCAACTTGGGAGAATTTCGAGTTGCTACCGATC
The pilo37 OAF  ------GATTTACCAGGG-TTCACGGGTAAGGGTAAAACACCCAACTTGGGAGAATTTCGAGTTGCTACCGATC
The sanc29 OAF  --------------------TCACGGGTAAGGGTAAAACACCCAACTTGGGAGAATTTCGAGTTGCTACCGATC
```

Input data matrix (continued):

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                          77777888888888889999999999000000000011111111112222222222333333333344444444
Taxon/Node                56789012345678901234567890123456789012345678901234567890123456789012345678
--------------------------------------------------------------------------------------------------------
Cycl esqui S C            AATCAGCTTCAAAAAAAATTTCTCAATTCTGTGTGCGTTTGGAGGCCAAACAAAGATTACGTTTCAATTATGGA
Cycl arida S C            AATCAGCTTCAAGAAAAATTTCTCAATTCTGTGTGCGTTTGGAGGCCAAACAAAGATTACGTTTCAATTATGGA
Cycl hispi S C            ------CTTCGAGAAAAATTTCTCAATTCTGGGTGCGTTTGGAGGCCAAACAAAGATTACGTTTCAATTATGGA
Ch augesce S C            AATCAGCTTCAAGAAAAATTTCTCAATTCTGTGTGCGTTTGGAGGCCAAACAAAGATTACGTTTCAATTATGGA
Cycl inter S C            --------------------------------------------------------------------------
Cycl griff S C            AATCAGCTTCAAGAAAAATTTCTCANTTCTGCGTGCGTTTGGAGGCCAAACAAAGATTACGTTTCAATTATGGA
Gl erubesc S C            AATCAGCTTCAAGAAAAATTTCTCAATTCTGTGTGCGTTTGGAGGCCAAACAAAGATTACGTTTCAATTATGGA
Go poitean S C            AATCATCTTCAAGGAAAATTTCTCACTTCTGTGTGCGTTTGGAGGCCAAACAAAGATTACGTTTTCATTATGGA
Cycl totto S C            AATCAGCTTCAAGAAAAATTTCTCAATTCTGTGTGCGTTTGGAGGCCAAACAAAGATTACGTTTCAATTATGGA
Ma torresi S C            AATCGGCTTCAAGAAAAATTTCTCAATTCTGTGTTCGTTTGGAGGCCAAACAGAGATTACGTTTCAATTATGGA
Cycloso sp S C            AATCAGCTTCAAGAAAAATTTCTCAATTCTGTGTGCGTTTGGAGGCCAAACAAAGATTACGTTTCAATTATGGA
Cycl crass S C            AATCAGCTTCAAGAAAAATGTCTCAATTCTGTGTGCGTTTGGAGGCCAAACAAAGATTACGTTTCAATTATGGA
Metat dayi S C            AATCAGCTTCGAGAAAAATCTCTCAATTCTGTGTGCGTTTGGAGGCCAAACAGAGATTACGTTTCAATTATGGA
Na aoristi S C            AATCAGCTTCAAGGAAAATTTCTCAATTCTGTGTGCGTTTGGAGGCCAAACAAAGATTACGTTTCAATTATGGA
The nevade S C            AATCAGCTTCAAGAAAAATTTCTCAATTCTGTGTGCGTTTGGAGGCCAAACAGAGATTACGTTTCAATTATGGA
Ph connect S C            ---------------------------------------------CCAANCAAAGATTACGTTTCAACTACGGA
Ph decursi S C            -------------------------ATTCTCCGTGCGTTTGGAGGCCAAACAAAGATTACGTTTCAACTACGGA
Pl archbol S C            AATCACCTTCAAGAAAAATTTCTCAATTCTGTGTGCGTTTGGAGGCCAAACAAAGATTACGTTTCAATTATGGA
Pn ecallos S C            AATCAGCTTCAAGGAAAATTTCTCAATTCTGTGTGCGTTTGGAGGCCAAACAAAGATTACGTTTCAATTATGGA
Cycl simpl S C            AATCACCTTCAAGAAAAATTTCTCAATTCTGGGGGCGTTTGGAGGCCAAACAAAGATTACGNTTCAATTATGGA
Psp aurita S C            AACCAGCTTCGAGAAAAATTTCTCAATTCTGTGTGCGTTTGGAGGCCAAACAAAGATTACGTTTCAACTACGGA
Sp pennige S C            AATCAGCTTCAAGGAAAATTTCTCAATTCTGTGTGCGTTTGGAGGCCAAACAAAGATTACGTTTCAATTATGGA
Cycl taiwa S C            AATCAGCTTCAAGGAAAATTTCTCAATTCTGTGTGCGTTTGGAGGCCAAACAAAGATTACGTTTCAATTATGGA
St leprieu S C            --------------------------------------------------------------------------
The palust S C            ----------------------------------GCGTTTGGAGGCCAAACAAAGATTACGTTTCAATTATGGA
Tr ciliata S C            AATCAGCTTCAAGGAAAATTTCTCAATTCTGTGNGCGTTTGGAGGCCAAACAAAGATTACGTTTCAATTATGGA
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Co seemann S C  AATCAGCTTCAAGAAAAATCTCTCAATTCTGTGTGCGTTTGGAGGCCAAACAGAGATTACGTTTCAATTATGGA
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Gymnocarpi S C  AATCAGCTTCGAGAAAAATTTCTCAATTCTGTGTGCGTTTGGAGGCCAAACAAAGATTACGTTTCAATTACGGA
Acystopter S C  AATCAGCTTCGAGAAAAATTTCTCAATTCTGTGTGCGTTTGGAGGCCAAACAAAGATTACGTTTCAATTACGGA
The oligoc S C  AATCAGCTTCAAGAAAAATTTCTCAATTCTGTGTGCGTTTGGAGGCCAAACAGAGATTACGTTTCAATTATGGA
The resi01 OAF  AATCAGCTTCAAGAAAAATTTCTCAATTCTGTGTCCGTTTGGAGGCTAAACAGAGATTACGTTTCAATTATGGA
The grac03 OAF  AATCAGCTTCAAGAAAAATTTCTCAATTCTGTGTGCGTTTGGAGGCCAAACAGAGATTACGTTTCAATTATGGA
The basi09 OAF  AATCAGCTTCAAGGAAAATTTCTCAATTCTGTGTGCGTTTGGAGGCCAAACAGAGATTACGTTTCAATTATGGA
The glan12 OAF  AATCAGCTTCAAGAAAAATTTCTCAATTCTGTGTGCGTTTGGAGGCCAAACAGAGATTACGTTTCAATTATGGA
The firm20 OAF  AATCAGCTTCAAGAAAAATTTCTCAATTCTGTGTGCGTTTGGAGGCCAAACAGAGATTACGTTTCAATTATGGA
The olig21 OAF  AATCAGCTTCAAGAAAAATTTCTCAATTCTGTGTGCGTTTGGAGGCCAAACAGAGATTACGTTTCAATTATGGA
The cora19 OAF  AATCAGCTTCAAGAAAAATTTCTCAATTCTGTGTGCGTTTGGAGGCCAAACAGAGATTACGTTTCAATTATGGA
The rudi11 OAF  ----------------------------------------------------GAGATTACGTTTCAATTATGGA
The hete30 OAF  AATCAGCTTCAAGAAAAATTTCTCAATTCTGTGTGCGTTTGGAGGCCAAACAGAGATTACGTTTCAATTATGGA
The glob56 OAF  AATCAGCTTCAAGAAAAATTTCTCAATTCTGTGTGCGTTTGGAGGCCAAACAAAGATTACGTTTCAATTATGGA
The amph86 OAF  AATCAGCTTCAAGAAAAATTTCTCAATTCTGTGTCCGTTTGGAGGCTAAACAGAGATTACGTTTCAATTATGGA
The balb_L OAF  AATCAGCTTCAAGAAAAATTTCTCAATTCTGTGTCCGTTTGGAGGCTAAACAGAGATTACGTTTCAATTATGGA
The balb_B OAF  AATCAGCTTCAAGAAAAATTTCTCAATTCTGTGTCCGTTTGGAGGCTAAACAGAGATTACGTTTCAATTATGGA
The cons73 OAF  AATCAGCTTCAAGAAAAATTTCTCAATTCTGTGTGCGTTTGGAGGCCAAACAGAGATTACGTTTCAATTATGGA
The germ_1 OAF  AATCAGCTTCAAGAAAAATTTCTCAATTCTGTGTGCGTTTGGAGGCCAAACAGAGATTACGTTTCAATTATGGA
The inab61 OAF  AATCAGCTTCAAGAAAAATTTCTCAATTCTGTGTGCGTTTGGAGGCCAAACAGAGATTACGTTTCAATTATGGA
The link59 OAF  --------------AAAATTTCTCACTTCTGTGTGCGTTTGGGGGCCAAACAAAAATTACGTTTCAATTATGGA
The oppo82 OAF  AATCAGCTTCACGAAAAATTTCTCAATTCTGTGTCCGTTTGGAGGCTAAACAGAGATTACGTTTCAATTATGGA
The rose36 OAF  AATCAGCTTCAAGAAAAATTTCTCAATTCTGTGTGCGTTTGGAGGCCAAACAGAGATTACGTTTCAATTATGGA
The rufa35 OAF  AATCAGCTTCAAGAAAAATTTCTCAATTCTGTGTGCGTTTGGAGGCCAAACAGAGATTACGTTTCAATTATGGA
The rust50 OAF  AATCAGCTTCAAGAAAAATTTCTCAATTCTGTGTGCGTTTGGAGGCCAAACAGAGATTACGTTTCAATTATGGA
The germ_2 OAF  AATCAGCTTCAAGAAAAATTTCTCAATTCTGTGTGCGTTTGGAGGCCAAACAGAGATTACGTTTCAATTATGGA
The pilo37 OAF  AATCAGCTTCAAGAAAAATTTCTCAATTCTGTGTGCGTTTGGAGGCCAAACAGAGATTACGTTTCAATTATGGA
The sanc29 OAF  AATCAGCTTCAAGAAAAATTTCTCAATTCTGTGTGCGTTTGGAGGCCAAACAGAGATTACGTTTCAATTATGGA
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Input data matrix (continued):

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                   45555555555666666666677777777778888888888999999999900000000001111111111222
Taxon/Node         90123456789012345678901234567890123456789012345678901234567890123456789012
--------------------------------------------------------------------------------------------
Cycl esqui S C     TTAACAGAGCGCTAACTACCAAAATACGTACGTATCGCTAGAAAAACTAGGGGTTCAACGGGCCAGGTACCATT
Cycl arida S C     TTAACAGAACGCTAACTACCAAAATACGTACGTATCGCTAGAAAAACTAGGGGTTCAACAGGCCAGGTACCATT
Cycl hispi S C     TTAACAGAGCGCTAACTACCAAAATACGTACGTATCGCTAGAAAAACTAGGGGTTCAACGGGCCAGGTACCATT
Ch augesce S C     TTAACAGAACGCTAACTACCAAAATACGTACGTATCGCCAGAAAAACTAGGGGTTCAACGGGCCAAGTACCATT
Cycl inter S C     ---------------------------------------------------------------------CCATT
Cycl griff S C     TTAACAGAACGCTAACTACCAAAATACGTACGTATCGCTAGAAAAACTAGGGGTTCAACGGGCCAAGNACCATT
Gl erubesc S C     TTAACAGAACGCTAACTACCAAAATACGTACGTATCGCTAGAAAAACTAGGGGTTCAACGGGCCAAGTACCATT
Go poitean S C     TTAACAGAACGCCAACTACCAAGATACGTACGTATCGCTAGAAAAACTACGGGTTCAACGGGCCAAGTACCATT
Cycl totto S C     TTAACAGAACGCTAACTACCAAAATACGTACGTATCGCTAGAAAAACTAGGGGTTCAACGGGCCAAGTATCATT
Ma torresi S C     TTAACAGAACGCTAACTACTGAAATATGTACGTATCGCTAGAAAAACTAGGGGTTCAACGGGCCAAGTACCACT
Cycloso sp S C     TTAACAGAACGCTAACTACCAAGATACGTACGTATCGCTAGAAAAACTAGGGGTTCAACGGGCCAAGTACCATT
Cycl crass S C     TTAACAGAACGCTAACTACCAAAATACGTACGTATCGCTAGAAAAACTAGGGGTTCAACGGGCCAAGTACCATT
Metat dayi S C     TTAACAGAACGCTAACTACCAAAATACGTACGTATCGCTAGAAAAACTAGGGGTTCAACGGGCCAAGTACCATT
Na aoristi S C     TTAACAGAACGCTAACTACCAAAATACGTACGTATTGCTAGAAAAACTAGGGGTTCAACGGGCCAGGTACCATT
The nevade S C     TTAACAGAACGCTAACTACCGAAATACGTACGTATCGCTAGAAAAACTAGGGGTTCAACGGGCCAAGTACCATT
Ph connect S C     TTAACAGAACGCTAACTACCAAAATACCTACGTATCGNTAGAAAAACTAGGGGTTCAACGGGCCAAGTACCACT
Ph decursi S C     TTAACAGAACGCTAACTACTAAAATACCTACGTGTCGCTAGAAAAACTAGGGGTTCAACGGGCCAAGTACCACT
Pl archbol S C     TTAACAGAACGCTAATTACCAAAATACGTACGTATCGCTAGAAAAACTAGGGGTTCAACGGGCCAAGTACCATT
Pn ecallos S C     TTAACAGAACGCTAACTACCAAAATACGTACGTATCGCTAGAAAAACTAGGGGTTCAACGGGCCAGGTACCATT
Cycl simpl S C     TTAACAGAACGCTAACTACCAAAATACGTACGTATCGCTAGAAAAACTAGGGGTTCAACGGGCCAAGTACCATT
Psp aurita S C     TTAACAGAACGCTAACTACTAAAATACCTACGTATCGCTAGAAAAACTAGGGGTTCAACGGGCCAAGTACCACT
Sp pennige S C     TTAACAGAACGCTAACTACCAAAATACGTACGTATCGCTAGAAGAACTAGGGGTTCAACGGGCCAGGTACCATT
Cycl taiwa S C     TTAACAGAACGCTAACTACCAAAATACGTACGTATCGCTAGAAAAACTAGGGGTTCAACGGGCCAGGTACCATT
St leprieu S C     ---------CGCTAACTACCAAAATACGTACGTATCGCTAGAAAAACTAGGGGTTCGACGGGCCAAGTACCATT
The palust S C     TTAACAGAACGCCAACTATTGAAATACGTACGTATCGNTAGAAAAACTAGGGGTTCAACGGGCCAAGTACCATT
Tr ciliata S C     TTAACAGAACGCTAACTACCAAAATACGTACGTATCGCTAGAAAAACTAGGGGTTCAACGGGCCAGGTACCATT
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Co seemann S C  TTAACAGAGCGCTAACTACCGAAATACGTACGTATCGCTAGAAAAACTAGGGGTTCAACGGGCCAAGTACCATT
Cystopteri S C  TTAACAGAACGCTAACTACTAAACTATGTACGTATCGCTAGAAAAACTAGGGGTTCAACGGGCCAAGTACCGCT
Gymnocarpi S C  TTAACAGAACGCTAACTACTAAAATATGTACGTATCGCTAGAAAAACTAGGGGTTCGACGGGCCAGGTACTGCT
Acystopter S C  TTAACAGAACGCTAACTACTAAAATATGTACGTATCGCTAGAAAAACTAGGGGTTCAACGGGCCAAGTACCACT
The oligoc S C  TTAACAGAACGCTAACTGCCGAAATACGTACGTATTGCTAGAAAAACTAGGGGTTCAACGGGCCAGGTACCATT
The resi01 OAF  TTAACAGAACGCTAACTACCGAAATACGTACGTATTGCTAGAAAAACTAGGGGTTCAACGGGCCAAGTACCATT
The grac03 OAF  TTAACAGAACGCTAACTACCGAAATACGTACGTATTGCTAGAAAAACTAGGGGTTCAACGGGCCAGGTACCATT
The basi09 OAF  TTAACAGAACGCTAACTACCGAAATACGTACGTATTGCTAGAAAAACTAGGGGTTCAACGGGCCAGGTACCATT
The glan12 OAF  TTAACAGAACGCTAACTACCGAAATACGTACGTATTGCTAGAAAAACTAGGGGTTCAACGGGCCAAGTACCATT
The firm20 OAF  TTAACAGAACGCTAACTACCGAAATACGTACGTATTGCTAGAAAAACTAGGGGTTCAACGGGCCAGGTACCATT
The olig21 OAF  TTAACAGAACGCTAACTGCCGAAATACGTACGTATTGCTAGAAAAACTAGGGGTTCAACGGGCCAGGTACCATT
The cora19 OAF  TTAACAGAACGCTAACTACCGAAATACGTACGTATTGCTAGAAAAACTAGGGGTTCAACGGGCCAGGTACCATT
The rudi11 OAF  TTAACAGAACGCTAACTACCGAAATACGTACGTATTGCTAGAAAAACTAGGGGTTCAACGGGCCAGGTACCATT
The hete30 OAF  TTAACAGAACGCTAACTACCGAAATACGTACGTATTGCTAGAAAAACTAGGGGTTCAACGGGCCAGGTACCATT
The glob56 OAF  TTAACAGAACGCTAACTACCGAAATACGTACGTATTGCTAGAAAAACTAGGGGTTCAACGGGCCAAGTACCATT
The amph86 OAF  TTAACAGAACGCTAACTACCGAAATACGTACGTATTGCTAGAAAAACTAGGGGTTCAACGGGCCAAGTACCATT
The balb_L OAF  TTAACAGAACGCTAACTACCGAAATACGTACGTATTGCTAGAAAAACTAGGGGTTCAACGGGCCAAGTACCATT
The balb_B OAF  TTAACAGAACGCTAACTACCGAAATACGTACGTATTGCTAGAAAAACTAGGGGTTCAACGGGCCAAGTACCATT
The cons73 OAF  TTAACAGAACGCTAACTACCGAAATACGTACGTATTGCTAGAAAAACTAGGGGTTCAACGGGCCAAGTACCATT
The germ_1 OAF  TTAACAGAACGCTAACTACCAAAATACGTACGTATTGCTAGAAAAACTAGGGGTTCAACGGGCCAGGTACCATT
The inab61 OAF  TTAACAGAACGCTAACTACCGAAATACGTACGTATTGCTAGAAAAACTAGGGGTTCAACGGGCCAGGTACCATT
The link59 OAF  TTAACAGAGCGCTAACTACCGAAATACGTACGTATTGCTAGAAAAACTAGGGGTTCAACGGGCCGGGTACCATT
The oppo82 OAF  TTAACAGAACGCTAACTACCGAAATACGTACGTATTGCTAGAAAAACTAGGGGTTCAACGGGCCAAGTACCATT
The rose36 OAF  TTAACAGAACGCTAACTACCGAAATACGTACGTATTGCTAGAAAAACTAGGGGTTCAACGGGCCAGGTACCATT
The rufa35 OAF  TTAACAGAACGCTAACTACCGAAATACGTACGTATTGCTAGAAAAACTAGGGGTTCAACGGGCCAAGTACCATT
The rust50 OAF  TTAACAGAACGCTAACTACCGAAATACGTACGTATTGCTAGAAAAACTAGGGGTTCAACGGGCCAGGTACCATT
The germ_2 OAF  TTAACAGAACGCTAACTACCAAAATACGTACGTATTGCTAGAAAAACTAGGGGTTCAACGGGCCAGGTACCATT
The pilo37 OAF  TTAACAGAACGCTAACTACCGAAATACGTACGTATTGCTAGAAAAACTAGGGGTTCAACGGGCCAGGTACCATT
The sanc29 OAF  TTAACAGAACGCTAACTACCGAAATACGTACGTATTGCTAGAAAAACTAGGGGTTCAACGGGCCAGGTACCATT
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Input data matrix (continued):

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                 22222222222222222222222222222222222222222222222222222222222222222222222222
                 22222223333333333444444444455555555556666666666777777777788888888889999999
Taxon/Node       34567890123456789012345678901234567890123456789012345678901234567890123456
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Cycl esqui S C   GCAATTACTCGAAATGCGTCTAGATAATATTATTTTCAACTTAGGTATGGCTTCCACGATTCCTGCCGCTAGGC
Cycl arida S C   GCAATTACTCGAAATGCGTCTAGATAATATTATTTTCAACTTAGGTATGGCTTCCACGATTCCTGCCGCTAGGC
Cycl hispi S C   GCAATTACTCGAAATGCGTCTAGATAATATTCTTTTCAACTTAGGTATGGCTTCCACGATTCCTGCCGCTAGGC
Ch augesce S C   GCAATTACTCGAGATGCGTCTAGATAATGTTATTTTCAACTTAGGTATGGCTTCCACGATTCCTGCCGCTAGGC
Cycl inter S C   GCAATTACTCGAAATGCGTCTAGATAATGTTATTTTCAACTTAGGTATGGCTTCCACGATTCCTGCCGCTAGGC
Cycl griff S C   GCNATTACTCGAAATGCGTNTAGATAATGCNATTTTCCACTTAGCNCTGGCTTCCACGATTCCTGCCGCTAGGC
Gl erubesc S C   GCAATTACTCGAAATGCGTCTAGATAATATTATTTTCAACTTAGGTATGGCTTCCACGATTCCTGCCGCTAGGC
Go poitean S C   GCAATTACTCGAAATGCGTCTAGATAATGTTATTTTTCACTTACGTATGGCTTCCACGATTCCTGCCGCTAGGC
Cycl totto S C   GCAATTACTCGAAATGCGTCTAGATAATGTTATTTTCCACTTAGGTATGGCTTCCACGATTCCTGCCGCTAGGC
Ma torresi S C   GCAACTACTCGAGATGCGTCTAGATAATGTTATTTTTCACTTAGGTATGGCTTCCACGATTCCTGCCGCTAGGC
Cycloso sp S C   GCAACTACTTGAAATGCGTCTAGATAATGTTATTTTCAACTTAGGTATGGCTTCCACGATTCCTGCCGCTAGGC
Cycl crass S C   GCAATTACTCGAAATGCGTCTAGATAATGTTATTTTCAACTTAGGTATGGCTTCCACGATTCCTGCCGCTAGGC
Metat dayi S C   GCAATTACTCGAGATGCGTCTAGATAATGTTATTTTTCACTTAGGTATGGCTTCCACGATTCCTGCTGCTAGGC
Na aoristi S C   GCAATTACTCGAAATGCGTCTAGATAATATTATTTTCAACTTAGGCATGGCTTCCACGATTCCTGCCGCTAGGC
The nevade S C   GCAATTACTCGAGATGCGTCTAGATAATGTTATTTTTCACTTAGGTATGGCTTCCACGATTCCTGCTGCTAGAC
Ph connect S C   GCAATTACTCGAGATGCGTCTAGATAATGTTATTTTTCACCTAGGTATGGCTTCCACGATTCCTGCCGCTAGGC
Ph decursi S C   GCAATTACTCGAGATGCGTTTAGATAATGTTATTTTTCACCTAGGTATGGCTTCCACGATTCCTGCCGCTAGGC
Pl archbol S C   GCAATTACTCGAAATGCGTTTAGATAATATTATTCTCCACTTAGGTATGGCTTCCACGATTCCTGCCGCTAGGC
Pn ecallos S C   GCAATTACTCGAAATGCGTTTAGATAATATTATTTTCAACTTAGGCATGGCTTCCACGATTCCTGCCGCTAGGC
Cycl simpl S C   GCAATTACTCGAAATGCGCCTAGATAATATTATTTTCAACTTAGGTATGGCTTCCACGATTCCTGCCGCTAGGC
Psp aurita S C   GCAATTACTCGAGATGCGTCTAGATAATGTTATTTTTCACCTAGGTATGGCTTCCACGATTCCTGCCGCTAGGC
Sp pennige S C   GCAATTACTCGAAATGCGTCTAGATAATATTATTTTCAACTTAGGCATGGCTTCCACGATTCCTGCCGCTAGGC
Cycl taiwa S C   GCAATTACTCGAAATGCGTTTAGATAATATTATTTTCAACTTAGGCATGGCTTCCACGATTCCTGCCGCTAGGC
St leprieu S C   GCAATTACTCGNAATGCGTCTAGATAATGGTATTTTTCACTTAGGTATGGCTTCCACGATTCCTGCCGCTAGGC
The palust S C   GCAATTACTCGAGATGCGTCTGGATAATGTTATTTTTCGCCTAGGTATGGCTTCCACGATTCCTGCCGNTAGGC
Tr ciliata S C   GCAATTACTCGAAATGCGTTTAGATAATATTATTTTCAACTTAGGCATGGCTTCCACGATTCCTGCCGCTAGGC
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Co seemann S C   GCAATTACTCGAGATGCGTCTAGATAATGTTATTTTTCACTTAGGTATGGCTTCCACGATTCCTGCTGCTAGGC
Cystopteri S C   GCAATTACTCGAGATGCGTCTAGATAATGTTCTTTTCGATTTAGGTATGGCTTCCACGATTCCTGCCGCTAGAC
Gymnocarpi S C   GCAATTACTTGAGATGCGTCTAGATAATATTATTTTTGACCTAGGTATGGCTTCCACAATTCCTGCCGCTAGAC
Acystopter S C   GCAATTACTCGAGATGCGTCTAGATAATGTTATTTTTGACTTAGGTATGGCTTCCACGATTCCTGCCGCTAGAC
The oligoc S C   GCAATTACTCGAGATGCGTCTAGATAATGTCATTTTTCACTTAGGTATGGCTTCCACGATTCCTGCTGCTAGGC
The resi01 OAF   GCAATTACTCGAGATGCGTCTAGATAATGTCATTTTTCACTTAGGTATGGCTTCCACGATTCCTGCTGCTAGGC
The grac03 OAF   GCAATTACTCGAGATGCGTCTAGATAATGTCATTTTTCACTTAGGTATGGCTTCCACGATTCCTGCTGCTAGGC
The basi09 OAF   GCAATTACTCGAGATGCGTCTAGATAATGTCATTTTTCACTTAGGTATGGCTTCAACGATTCCTGCTGCTAGGC
The glan12 OAF   GCAATTACTCGAGATGCGTCTAGATAATGTCATTTTTCACTTAGGTATGGCTTCCACGATTCCTGCTGCTAGGC
The firm20 OAF   GCAATTACTCGAGATGCGTCTAGATAATGTCATTTTTCACTTAGGTATGGCTTCAACGATTCCTGCTGCTAGGC
The olig21 OAF   GCAATTACTCGAGATGCGTCTAGATAATGTCATTTTTCACTTAGGTATGGCTTCCACGATTCCTGCTGCTAGGC
The cora19 OAF   GCAATTACTCGAGATGCGTCTAGATAATGTCATTTTTCACTTAGGTATGGCTTCCACGATTCCTGCTGCTAGGC
The rudi11 OAF   GCAATTACTCGAGATGCGTCTAGATAATGTCATTTTTCACTTAGGTATGGCTTCCACGATTCCTGCTGCTAGGC
The hete30 OAF   GCAATTACTCGAGATGCGTCTAGATAATGTCATTTTTCACTTAGGTATGGCTTCCACGATTCCTGCTGCTAGGC
The glob56 OAF   GCAATTACTCGAGATGCGTCTAGATAATGTCATTTTTCACTTAGGTATGGCTTCCACGATTCCTGCTGCTAGGC
The amph86 OAF   GCAATTACTCGAGATGCGTCTAGATAATGTCATTTTTCACTTAGGTATGGCTTCCACGATTCCTGCTGCTAGGC
The balb_L OAF   GCAATTACTCGAGATGCGTCTAGATAATGTCATTTTTCACTTAGGTATGGCTTCCACGATTCCTGCTGCTAGGC
The balb_B OAF   GCAATTACTCGAGATGCGTCTAGATAATGTCATTTTTCACTTAGGTATGGCTTCCACGATTCCTGCTGCTAGGC
The cons73 OAF   GCAATTACTCGAGATGCGTCTAGATAATGTCATTTTTCACTTAGGTATGGCTTCCACGATTCCTGCTGCTAGGC
The germ_1 OAF   GCAATTACTCGAGATGCGTCTAGATAATGTCATTTTTCACTTAGGTATGGCTTCCACGATTCCTGCTGCTAGGC
The inab61 OAF   GCAATTACTCGAGATGCGTCTAGATAATGTCATTTTTCACTTAGGTATGGCTTCCACGATTCCTGCTGCTAGGC
The link59 OAF   GCAACTACCCAAAATGCGTCTAGATAATGGCATTTTTCACTTAGGTATGGCTTCCACAATTCCGGCTGCTAGGC
The oppo82 OAF   GCAATTACTCGAGATGCGTCTAGATAATGTCATTTTTCACTTAGGTATGGCTTCCACGATTCCTGCTGCTAGGC
The rose36 OAF   GCAATTACTCGAGATGCGTCTAGATAATGTCATTTTTCACTTAGGTATGGCTTCCACGATTCCTGCTGCTAGGC
The rufa35 OAF   GCAATTACTCGAGATGCGTCTAGATAATGTCATTTTTCACTTAGGTATGGCTTCCACGATTCCTGCTGCTAGGC
The rust50 OAF   GCAATTACTCGAGATGCGTCTAGATAATGTCATTTTTCACTTAGGTATGGCTTCCACGATTCCTGCTGCTAGGC
The germ_2 OAF   GCAATTACTCGAGATGCGTCTAGATAATGTCATTTTTCACTTAGGTATGGCTTCCACGATTCCTGCTGCTAGGC
The pilo37 OAF   GCAATTACTCGAGATGCGTCTAGATAATGTCATTTTTCACTTAGGTATGGCTTCCACGATTCCTGCTGCTAGGC
The sanc29 OAF   GCAATTACTCGAGATGCGTCTAGATAATGTCATTTTTCACTTAGGTATGGCTTCAACGA---------------
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Input data matrix (continued):

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                    22233333333333333333333333333333333333333333333333333333333333333333333333
                    99900000000001111111111222222222233333333334444444444555555555566666666667
Taxon/Node          78901234567890123456789012345678901234567890123456789012345678901234567890
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Cycl esqui S C      AGTTAGTCAACCATAGACATATTTTAGTAAACAATCATATTGTAGATATACCAAGCTATCGCCGTAAGCCAAGA
Cycl arida S C      AGTTANTCAACCATAGACATATTTTAGTAAACAATCATGTTGTAGATATACCAAGCTATCGCCGTAAGCCAAGA
Cycl hispi S C      AGTTAGTCAACCATAGACATATTTTAGTAAACAATCATATTGTAGATATACCAAGCTATCGCCGTAAGCCAAGA
Ch augesce S C      AGTTAGTCAACCACAGACATATTTTAGTAAACAATCATATTGTAGATATACCAAGCTATCGCCGTAAGCCAAGA
Cycl inter S C      AGTTAGTCAACCACAGACATATTTTAGTAAACAATCATATTGTAGATATACCAAGCTATCGCTGTAAGCCAAGA
Cycl griff S C      AGTTAGTCAACCACAGACATATNTTAGTAAACAATCGTATTGTAGATATACCAAGCTATCGCTGTAAGCCAAAA
Gl erubesc S C      AGTTAGTCAACCACAGACATATTTTAGTAAACAATCATATTGTAGATATACCAAGCTATCGCCGTAAGCCAAGA
Go poitean S C      AGTTAGTCTACCTCAAACATATTTTGGTAAACAATCATATTGTAGATATACCAAGCTATCGCTGTAAGCCAAAA
Cycl totto S C      AGTTAGTCAACCACAGACATATCTTAGTAAACAATCGTATTGTAGATATACCAAGCTATCGCTGTAAGCCAAAA
Ma torresi S C      AGTTAGTCAATCACAGACATATTTTAGTGAACGGTCGTATCGTANATATACCAAGCTATCGCTGTAAGCCGAAA
Cycloso sp S C      AGTTAGTCAACCACAGACATATTTTAGTAAACAATCATATTGTAGATATACCAAGCTATCGCCGTAAGCCAAGA
Cycl crass S C      AGTTAGTCAGCCACAGACATATTTTAGTAAACAATCATATTGTAGATATACCAAGCTATCGCCGTAAACCAAGA
Metat dayi S C      AGTTAGTCAATCACAGACATATTTTGGTGAACAATCGTATTGTAGATATACCAAGCTATCGCTGTAAGCCGGGA
Na aoristi S C      AGTTAGTCAACCATAGACATATTTTAGTAAACAATCATATTGTAGATATACCAAGCTATCGCTGTAAGCCAAGA
The nevade S C      AGTTAGTTAATCACAGACACATTTTAGTGAACAATCGTATTGTAGATATACCAAGCTATCGCTGTAAGCCGAGA
Ph connect S C      AGTTAGTCAATCACAGACATATTTTAGTGAACAATCGTATTGTAGATATACCAAGCTATCGCTGTAAGCCGAAA
Ph decursi S C      AGTTAGTCAATCACAGACATATTTTAGTGAACAATCGTATTGTAGATATACCAAGCTATCGNTGTAAGCCGAAA
Pl archbol S C      AGTTAGTCAACCACAGACCTATTTTAGTAAACAATCATATTGTAGATATACCAAGCTATCGCCGTAAGCCAAGA
Pn ecallos S C      AGTTAGTCAACCATAGACATATTTTAGTAAACAATCATATTGTAGATATACCAAGCTATCGCCGTAAGCCAAGA
Cycl simpl S C      AGNTAGTCAACCATAGACATATTTTAGTAAACAATCATATTGTAGATATACCAAGCTATCGCCGTAAGCCAAGA
Psp aurita S C      AGTTAGTCAATCACAGACATATTTTAGTGAACAATCGTATTGTAGATATACCAAGCTATCGCTGTAAGCCGAAA
Sp pennige S C      AGTTAGTCAACCATAGACATATTTTAGTAAACAATCATATTGTAGATATACCAAGCTATCGCCGTAAGCCAAGA
Cycl taiwa S C      AGTTAGTCAACCATAGACATATTTTAGTAAACAATCATATTGTAGATATACCAAGCTATCGCCGTAAGCCAAGA
St leprieu S C      AGCTAGTCAACCACAGACATATTTTAGTAGACAACCGTATTGTAGATATACCAAGCTATCGCTGTAAGCCANAA
The palust S C      AGTTAGTCAATCACAGACATATTTTAGTGAACAATCGTATTGTAGATATACCAAGCTATCGNTGTAAGCCGAAA
Tr ciliata S C      AGTTAGTCAACCATAGACATATTTTAGTAAACAATCATATTGTAGATATACCAAGCTATCGCCGTAAGCCAAGA
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Co seemann S C  AGTTAGTCAATCACAGACATATTTTGGTGAACAATCGTATTGTAGATATACCAATCTATCGCTGTAAACCAAAA
Cystopteri S C  AGTTAGTTAATCACAGACATATTTTAGTGAACAATCGTATTGTAGATATACCAAGCTATCGCTGTAAGCCGAAA
Gymnocarpi S C  AGTTAGTTAATCACAGACATATTTTAGTGAATAACCATATTGTAGATATACCAAGCTATCGCCGCAAGCCGAAA
Acystopter S C  AGTTAGTTAATCACAGACATATTTTAGTGAACAATCGTATTGTAGATATACCAAGCTATCGCTGTAAGCCGAAA
The oligoc S C  AGTTAGTCAATCACAGACATATTTTAGTGAACAATCGTATTGTAGATATACCAAGCTATCGCTGTAAGCCGAGA
The resi01 OAF  AGTTAGTCAATCACAGACATATTTTAGTGAACAATCGTATTGTAGATATACCAAGCTATCGCTGTAAGCCGAGA
The grac03 OAF  AGTTAGTCAATCACAGACATATTTTAGTGAACAATCGTATTGTAGATATACCAAGCTATCGCTGTAAGCCGAGA
The basi09 OAF  AGTTAGTCAATCACAGACATATTTTAGTGAACAATCGTATTGTAGATATACCAAGCTATCGCTGTAAGCCGAGA
The glan12 OAF  AGTTAGTCAATCACAGACATATTTTAGTGAACAATCGTATTGTAGATATACCAAGCTATCGCTGTAAGCCGAGA
The firm20 OAF  AGTTAGTCAATCACAGACATATTTTAGTGAACAATCGTATTGTAGATATACCAAGCTATCGCTGTAAGCCGAGA
The olig21 OAF  AGTTAGTCAATCACAGACATATTTTAGTGAACAATCGTATTGTAGATATACCAAGCTATCGCTGTAAGCCGAGA
The cora19 OAF  AGTTAGTCAATCACAGACATATTTTAGTGAACAATGGTATTGTAGATATACCAAGCTATCGCTGTAAGCCGAGA
The rudi11 OAF  AGTTAGTCAATCACAGACATATTTTAGTGAACAATCGTATTGTAGATATACCAAGCTATCGCTGTAAGCCGAGA
The hete30 OAF  AGTTAGTCAATCACAGACATATTTTAGTGAACAATCGTATTGTAGATATACCAAGCTATCGCTGTAAGCCGAGA
The glob56 OAF  AGTTAGTCAATCACAGACATATTTTAGTGAACAATGGTATTGTAGATATACCAAGCTATCGCTGTAAGCCGAGA
The amph86 OAF  AGTTAGTCAATCACAGACATATTTTAGTGAACAATCGTATTGTAGATATACCAAGCTATCGCTGTAAGCCGAGA
The balb_L OAF  AGTTAGTCAATCACAGACATATTTTAGTGAACAATCGTATTGTAGATATACCAAGCTATCGCTGTAAGCCGAGA
The balb_B OAF  AGTTAGTCAATCACAGACATATTTTAGTGAACAATCGTATTGTAGATATACCAAGCTATCGCTGTAAGCCGAGA
The cons73 OAF  AGTTAGTCAATCACAGACATATTTTAGTGAACAATCGTATTGCAGATATACCAAGCTATCGCTGTAAGCCGAGA
The germ_1 OAF  AGTTAGTCAATCACAGACATATTTTAGTGAACAATCGTATTGTAGATATACCAAGCTATCGCTGTAAGCCGAGA
The inab61 OAF  AGTTAGTCAATCACAGACATATTTTAGTGAACAATCGTATTGTAGATATACCAAGCTATCGCTGTAAGCCGAGA
The link59 OAF  AGTTAGTCAATCACAGACATATTTTAGTGAACAATCGTATTGTAGATATACCAAGCTATCGCTGTAAGCCGAGA
The oppo82 OAF  AGTTAGTCAATCACAGACATATTTTAGTGAACAATCGTATTGTAGATATACCAAGCTATCGCTGTAAGCCGAGA
The rose36 OAF  AGTTAGTCAATCACAGACATATTTTAGTGAACAATCGTATTGTAGATATACCAAGCTATCGCTGTAAGCCGAGA
The rufa35 OAF  AGTTAGTCAATCACAGACATATTTTAGTGAACAATCGTATTGTAGATATACCAAGCTATCGCTGTAAGCCGAGA
The rust50 OAF  AGTTAGTCAATCACAGACATATTTTAGTGAACAATCGTATTGTAGATATACCAAGCTATCGCTGTAAGCCGAGA
The germ_2 OAF  AGTTAGTCAATCACAGACATATTTTAGTGAACAATCGTATTGTAGATATACCAAGCTATCGCTGTAAGCCGAGA
The pilo37 OAF  AGTTAGTCAATCACAGACATATTTTAGTGAACAATCGTATTGTAGATATACCAAGCTATCGCTGTAAGCCGAGA
The sanc29 OAF  --------------------------------------------------------------------------
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Input data matrix (continued):

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                    33333333333333333333333333334444444444444444444444444444444444444444444444
                    77777777778888888888999999999900000000001111111111222222222233333333334444
Taxon/Node          12345678901234567890123456789012345678901234567890123456789012345678901234
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Cycl esqui S C      GATATTATTACTGTTCGAAATCGACCAACTTCCCACAATGCACTGGGCAGTGAATCTCCCGTGGGGGGAAAAAC
Cycl arida S C      GATATTATTACTGTTCGAAATCGACCAACCTCCCACAATGCACTGGGGGGTGAATCTCTCGTGGGGGGCAAAAC
Cycl hispi S C      GATATTATTACTGTTCGAAATCGACCAACTTCCCACAATGCACTGGGCAGTGAATCTCCCGTGGGGGGCAAAAC
Ch augesce S C      GATATTATTACTGTTCGAAATCGACCAACTTCCCACAATGCACTGGGGGGTGAATCTCTCGTGGGGGGCAAAAC
Cycl inter S C      GATATTATTACTATCCGAAATCGACCAACTTCCCACAATGCACTGGGGGGTGAATCTTCCGTAGGGGTCGAAAC
Cycl griff S C      GATATTATTACTGTTCGAAATCGACCAACTTCCCACAATGCGCTGAGGAGTGAATCTTCCGTAGGGGGCAAAAC
Gl erubesc S C      GATATTATTACTGTTCGTAATCGACCAACTTCCCACAATGCACTGGGGGGTGCATCTCCCGTGGGGGGCAAAAC
Go poitean S C      GATATTATTACTGTTCGAAATCGACCAACTTCCCACAATGCACTGGGGGGTGAATCTCTCGTGGGGGGCAAAAC
Cycl totto S C      GATATTATTACTGTTCGAAATCGACCAACTTCCCACAATGCGCTGAGGGGTGAATCTCCCGTAGGGGGCAAAAC
Ma torresi S C      GATATTATCACTGTTCGAAATCGACCAAGTTCTTATAATGCGCTGAGGGGTGAGTCTCCCGGAGGGGACAAAAC
Cycloso sp S C      GATATTATTACTGTCCGAAATCGACCAACTTCCCACAATGCACTGGGGAGTGAATCTCCCGTAGGGGTAGAAAC
Cycl crass S C      GATATTATTACTACCCGAAATCGACCAACTTCCCACAATGCACTGGAGGGTGAATCTCCCGTAGGGGGCGAAAC
Metat dayi S C      GATATTATTAATGTTCGAAATCGACCAACTTCCTGCAATGCGCTGGGGGGTGAGTCTCCCGGAGGGGACAAAAC
Na aoristi S C      GATATTATTACTGTTCGAAATCGACCAACTTCCCACAATGCACTGGGCAGTGAATCTCCCGTGGGGGGCAAAAC
The nevade S C      GATATTATTACTGTTCGAAATCGACCAACTTCCTGCAATGCGCTGGGGGGTGAGTCTCCCGGAGGGGACAAAAC
Ph connect S C      GATATTATCACTGTTCGAGATCGACCAACTTCCTGTAATGCGCTGAAAGGTGAGTCTCCCGGAGGGGACAAAAC
Ph decursi S C      GATATTATCACTGTTCGAAATCGACCAACTTCCTGTAATGCGCTGAAGGGTGAGTCTCCCGGAGGGGACAAAAC
Pl archbol S C      GATATTATTACTGTTCGAAATCGACCAACTTCCCACAATGCACTGGGGGGTGAATCTCCCGTGGGGCACAAAAC
Pn ecallos S C      GATATTATTACTGTTCGAAATCGACCAACTTCCCACAATGCACTGGGCAGTGAATATCCCGTGGGGGGCAAAAC
Cycl simpl S C      GATATTATTACTGTTCGAGATCGATCAACTTCCCACGATGCACTGGGGAAGGAATCTCCCGTGGGGGGCAAAAC
Psp aurita S C      GATATTATCACTGTTCGAAATCGACCAACTTCCTGTAATGCGCTGAAGGGTGAGTCTCCCGGAGGGGACAAAAC
Sp pennige S C      GATATTATTACTGTTCGAAATCGACCAACTTCTCACAATGCACTGGGCAGTGAATCTCCCGCGGGGGACAAAAC
Cycl taiwa S C      GATATTATTACTGTTCGAAATCGACCAACTTCCCACAATGCACTGGGCAGTGAATCTCCCGTGGGGGGCAAAAC
St leprieu S C      GATATTATTACTGTTCGAAATCGACCAACTTCCTACAATGCGCTGGGGGNGAATCTCCCATAGGGGGCANAAC
The palust S C      GATATTATTACCGTTCGAAATCGACCAACTTCCTATAATGCGCTGAGGGGTGAGTCTCCCGGAGGGGACAAGAC
Tr ciliata S C      GATATTATTACTGTTCGAAATCGACCAACTTCTCACAATGCACTGGGCAGTGAATCTCCCGTGGGGGGCAAAAC
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Co seemann S C  GATATTATTACTGTCCGAAATCGACCAACTTCCTACAATGCGCTGGGGGGTGAGTCTCCCGGAGGGGACAAAAC
Cystopteri S C  GATATTACTACTGCTCGAAATCGACCAGCTTCTTGTAATGCGCTGAGAGGTAAGTCTCCCGGAGGGGACAAAAT
Gymnocarpi S C  GATATTATTACTGCTCGAAATCGACCAGCTTCTTGTAATGCGTTGAGCGGTAAGTCTCCCGGAGGGAACAAAAT
Acystopter S C  GATATTACTACTGCTCGAAATCGACCAGCTTCTTGTAATGCGCTGAGAGGTAAGTCTACCGGAGGGGACAAAAT
The oligoc S C  GATATTATTACTGTTCGAAATCGACCAACTTCCTGCAATGCGCTGGGGGGTGAGTCTCCCGGAGGGGACAAAAC
The resi01 OAF  GATATTATTACTGTTCGAAATCGACCAACTTCCTGCAATGCACTGGGGGGTGAGTCTCCCGGAGGGGACAAAAC
The grac03 OAF  GATATTATTACTGTTCGAAATCGACCAACTTCCTGCAATGCGCTGGGGGGTGAGTCTCCCGGAGGGGACAAAAC
The basi09 OAF  GATATTATTACTGTTCGAAATCGACCAACTTCCTGCAATGCGCTGGGGGGTGAGTCTACCGGAGGGGACAAAAC
The glan12 OAF  GATATTATTACTGTTCGAAATCGACCAACTTCCTGCAATGCGCTGGGGGGTGAGTCTCCCGGAGGGGACAAAAC
The firm20 OAF  GATATTATTACTGTTCGAAATCGACCAACTTCCTGCAATGCGCTGGGGGGTGAGTCTCCCGGAGGGGACAAAAC
The olig21 OAF  GATATTATTACTGTTCGAAATCGACCAACTTCCTGCAATGCGCTGGGGGGTGAGTCTCCCGGAGGGGACAAAAC
The cora19 OAF  GATATTATTACTGTTCGAAATCGACCAACTTCCTGCAATGCGCTGGGGGGTGAGTCTCCCGGAGGGGACAAAAC
The rudi11 OAF  GATATTATTACTGTTCGAAATCGACCAACTTCCTGCAATGCGCTGGGGGGTGAGTCTCCCGGAGGGGACAAAAC
The hete30 OAF  GATATTATTACTGTTCGAAATCGACCAACTTCCTGCAATGCGCTGGGGGGTGAGTCTCCCGGAGGGGACAAAAC
The glob56 OAF  GATATTATTACTGTTCGAAATCGACCAACTTCCTGCAATGCGCTGGGGGGTGAGTCTCCCGGAGGGGACAAAAC
The amph86 OAF  GATATTATTACTGTTCGAAATCGACCAACTTCCTGCAATGCACTGGGGGGTGAGTCTCCCGGAGGGGACAAAAC
The balb_L OAF  GATATTATTACTGTTCGAAATCGACCAACTTCCTGCAATGCACTGGGGGGTGAGTCTCCCGGAGGGGACAAAAC
The balb_B OAF  GATATTATTACTGTTCGAAATCGACCAACTTCCTGCAATGCACTGGGGGGTGAGTCTCCCGGAGGGGACAAAAC
The cons73 OAF  GATATTATTACTGTTCGAAATCGACCAACTTCCTGCAATGCGCTGGGGGGTGAGTCTCCCGGAGGGGACAAAAC
The germ_1 OAF  GATATTATTACTGTTCGAAATCGACCAACTTCCTGCAATGCGCTGGGGGGTGAGTCTCCCGGAGGGGACAAAAC
The inab61 OAF  GATATTATTACTGTTCGAAATCGACCAACTTCCTGCAATGCGCTGGGGGGTGAGTCTCCCGGAGGGGACAAAAC
The link59 OAF  GATATTATTACTGTTCGAAATCGACCAACTTCCTGCAATGCGCTGGGGGGTGAGTCTCCCGGAGGGGACAAAAC
The oppo82 OAF  GATATTATTACTGTTCGAAATCGACCAACTTCCTGCAATGCACTGGGGGGTGAGTCTCCCGGAGGGGACAAAAC
The rose36 OAF  GATATTATTACTGTTCGAAATCGACCAACTTCCTGCAATGCGCTGGGGGGTGAGTCTCCCGGAGGGGACAAAAC
The rufa35 OAF  GATATTATTACTGTTCGAAATCGACCAACTTCCTGCAATGCGCTGGGGGGTGAGTCTCCCGGAGGGGACAAAAC
The rust50 OAF  GATATTATTACTGTTCGAAATCGACCAACTTCCTGCAATGCGCTGGGGGGTGAGTCTCCCGGAGGGGACAAAAC
The germ_2 OAF  GATATTATTACTGTTCGAAATCGACCAACTTCCTGCAATGCGCTGGGGGGTGAGTCTCCCGGAGGGGACAAAAC
The pilo37 OAF  GATATTATTACTGTTCGAAATCGACCAACTTCCTGCAATGCGCTGGGGGGTGAGTCTCCCGGAGGGGACAAAAC
The sanc29 OAF  --------------------------------------------------------------------------
```

Input data matrix (continued):

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                 44444444444444444444444444444444444444444444444444444445555555555555555555
                 44444555555555566666666667777777777888888888899999999990000000000111111111
Taxon/Node       56789012345678901234567890123456789012345678901234567890123456789012345678
-------------------------------------------------------------------------------------------
Cycl esqui S C   ACCGGATCACTTGACCATTTCTCTACTGGGAGGCAACNGGCCAGCAGGATTGGTGAATCGTATTGCCAACCGAG
Cycl arida S C   ACCGGATCACTTGACCATTTCTNTACTGGGAGGCAACGGCCAGCAGGATTGGTGAATCGTGTTGCCAACCGAG
Cycl hispi S C   ACCGGATCACTTGACCATTTCTCTACTGGGAGGCAACGGCCAGCAGGGTTGGTGAATCATGTTGCCAACCGAG
Ch augesce S C   ACCGGATCACTTGACCATTTCTCTAATGGGAGGCAACGGCCAGCAGGATTGGTGAATCGTGTTGCCAATCGAG
Cycl inter S C   ACCGGATCACTTGACCATTTCTCTAATGGAAGGCAACAGGCCAGCAGGATTGGTGAATCGTGTTGCCAATCGAG
Cycl griff S C   ACCGGATCACTTGACCATTTCTCTACTGGAAGGCAACAGGCCAACGGGATTGGTGAATCGTGTTGCCAGTCGGG
Gl erubesc S C   ACCGGATCACTTGACCATTTCTCTACTAGGAGGCAATGGGCCAGCAGGATTGGTGAATCGTGTTGCCAACCGAG
Go poitean S C   ACCGGATCACTTGACCATTTCTCTACTGGAAGGCAACAGGCCAACAGGGTTGGTGAATCGTGTTGCCAATCGAG
Cycl totto S C   ACCGGATCACTTGACCATTTCTCTACTGGAAGGCAACAGGCCAACGGGATTGGTGAATCGTGTTGCCAGTCGGG
Ma torresi S C   GCCGGATCATTTGACTGTTTCTCTATTGGAAGGCAATAGGCCAACAGGATTGGTGAATCGTGTCGCCAATCGAG
Cycloso sp S C   ACCGGATCACTTGACCATTTCTCTACTGGAAGGCAAGGGGCCAGCAGGGTTGGTGAATCGTGTTGCCAATCGAG
Cycl crass S C   ACCGGATCACTTGACCATTTCTCTACTGGAAGGCAACAGGCCAGCAGGGTTGGTGAATCGTGTTGCCAATCGAG
Metat dayi S C   ACCGGATCACCTAACCGTTTCTNTATTGGAAGGCAACAGGCCAACAGGATTGGTGAATCGTGTTGCCAATCGAG
Na aoristi S C   ACCGGATCACTTGACCATTTCTCTAGTAGGAGGCGACGGGCCAGCAGGATTGGTGAATTGTGTCGCCAACCGAG
The nevade S C   ACCGGATCACTTGACCGTTTCTCTATCGGAAGGCAACAGGCCAACAGGATTGGTTAATCGTGTTGCCAATCGAG
Ph connect S C   GCCGGATCACTTGACTGTTTCTCTATTAGAAGGCAATAGGCCAACAGGGTTGGTTAATCGTGTTGCCAATCGAG
Ph decursi S C   GCCAGATCACTTGACTGTTTCTATATTAGAAGGCAATAGGCCAATAGGGTTGGTTAATCGTGTTGCCAATCGAG
Pl archbol S C   ACCGGATCACTTGACCATTTCTCTACCTGGAGGCAACGGCCAAGTAGGATTGGTAAATCGTGTTGCCAATCGAG
Pn ecallos S C   ACCGGATCACTTGACCATTTCTCTAGTGGGAGGCAACGGGCCAGCAGGATTGGTGAATCGTGTTGCCAACCGAG
Cycl simpl S C   ACCGGATCACTTGACCATTTCTCTACTGGGAGGCAACAGGCCAGCAGGATTGGTGAATCGTGTTGCCAATCGAG
Psp aurita S C   GCCGGATCACTTGACTGTTTCTCTATCGGAAGGCAATAGGCCAACAGGGTTGGTGAATCGTGTTGCCAATCGAG
Sp pennige S C   ACCGGATCACTTGACCATTTCTTTAGTGGGAGGCAACGGGCCAGCAGGATTGGTGAATCGTGTTGCCAACCGAG
Cycl taiwa S C   ACCGGATCACTTGACCATTTCTTTAGTGGGAGGCAACGGGCCAGCAGGATTGGTGAATCGTGTTGCCAACCGAG
St leprieu S C   ACCGGATCACTTGACCATTTCTCTACTGGAAGGCGACAGGCCCACAGGATTGGGTAATCGTGTTGCCAATCGAG
The palust S C   ACCGGATCACCTAACCGTTTCTCTATTGGAAGGCAACAGGCCAACAGGATTGGTGAATCGTGTTGCCAATCGAG
Tr ciliata S C   ACCGGATCACTTGACCATTTCTTTAGTGGGGAGCACCGGGCCACCAGGATTGGTGAATCGTGTTGCCAACCGAG
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Co seemann S C  ACCGGATCACTTGACCGTCTCTCTATTGGAAGGCAACAAGCCAACAGGATTGGTGAATCGTGTTGCCAATCGAG
Cystopteri S C  ACCGGATCACTTGACCTTTTCCCTATCGGAAGGCGACAGGCCAGCAGGGTTGGTTAATCGTGTTGCCAATCGAG
Gymnocarpi S C  ACCGGATCACTTGACGGTTTCTCTATCGGGAGGCAACGGGCCAACAGGATTGGTGAATCGCGTTGCCAATCGAG
Acystopter S C  ACCGGATCACTTGACCGTTTCTCTATCGGAAGGCAACAGGCCAGCAGGGTTGGTGAATCGTGTTGCCAATCGAG
The oligoc S C  ACCGGATCACTTGACCGTTTCTCTATCGGAAGGCAACAGGCCAACAGGATTGGTTAATCGNGTTGCCAATCGAG
The resi01 OAF  ACCGGATCACTTGACCGTTTCTCTATCGGAAGGCAACAGGCCAACAGGATTGGTTAATCGTGTTGCCAATCGAG
The grac03 OAF  ACCGGATCACTTGACCGTTTCTCTATCGGAAGGCAACAGGCCAACAGGATTGGTTAATCGTGTTGCCAATCGAG
The basi09 OAF  ACCGGATCACTTGACCGTTTCTCTATCCGAAGGCAACAGGCCAACAGGATTGGTTAATCGTGTTGCCAATCGAG
The glan12 OAF  ACCGGATCACTTGACCGTTTCTCTATCGGAAGGCAACAGGCCAACAGGATTGGTTAATCGTGTTGCCAATCGAG
The firm20 OAF  ACCGGATCACTTGACCGTTTCTCTATCCGAAGGCAACAGGCCAACAGGATTGGTTAATCGTGTTGCCAATCGAG
The olig21 OAF  ACCGGATCACTTGACCGTTTCTCTATCGGAAGGCAACAGGCCAACAGGATTGGTTAATCGTGTTGCCAATCGAG
The cora19 OAF  ACCGGATCACTTGACCGTTTCTCTATCGGAAGGCAACAGGCCAACAGGATTGGTTAATCGTGTTGCCAATCGAG
The rudi11 OAF  ACCGGATCACTTGACCGTTTCTCTATCGGAAGGCAACAGGCCAACAGGATTGGTTAATCGTGTTGCCAATCGAG
The hete30 OAF  ACCGGATCACTTGACCGTTTCTCTATCGGAAGGCAACAGGCCAACAGGATTGGTTAATCGTGTTGCCAATCGAG
The glob56 OAF  ACCGGATCACTTGACCGTTTCTCTATCGGAAGGCAACAGGCCAACAGGATTGGTTAATCGTGTTGCCAATCGAG
The amph86 OAF  ACCGGATCACTTGACCGTTTCTCTATCGGAAGGCAACAGGCCAACAGGATTGGTTAATCGTGTTGCCAATCGAG
The balb_L OAF  ACCGGATCACTTGACCGTTTCTCTATCGGAAGGCAACAGGCCAACAGGATTGGTTAATCGTGTTGCCAATCGAG
The balb_B OAF  ACCGGATCACTTGACCGTTTCTCTATCGGAAGGCAACAGGCCAACAGGATTGGTTAATCGTGTTGCCAATCGAG
The cons73 OAF  ACCGGATCACTTGACCGTTTCTCTATCGGAAGGCAACAGGCCAACAGGATTGGTTAATCGTGTTGCCAATCGAG
The germ_1 OAF  ACCGGATCACTTGACCGTTTCTCTATTGGAAGGCAACAGGCCAACAGGATTGGTTAATCGGGTTGCCAATCGAG
The inab61 OAF  ACCGGATCACTTGACCGTTTCTCTATCGGAAGGCAACAGGCCAACAGGATTGGTTAATCGTGTTGCCAATCGAG
The link59 OAF  ACCGGATCACTTGACCGTTTCTCTATCGGAAGGCAACAGGCCAACAGGATTGGTTAATCGTGTTGCCAATCGAG
The oppo82 OAF  ACCGGATCACTTGACCGTTTCTCTATTGGAAGGCAACAGGCCAACAGGATTGGTTAATCGTGTTGCCAATCGAG
The rose36 OAF  ACCGGATCACTTGACCGTTTCTATATCGGAAGGCAACAGGCCAACAGGATTGGTTAATCGTGTTGCCAATCGAG
The rufa35 OAF  ACCGGATCACTTGACCGTTTCTCTATCGGAAGGCAACAGGCCAACAGGATTGGTTAATCGTGTTGCCAGTCGAG
The rust50 OAF  ACCGGATCACTTGACCGTTTCTCTATCGGAAGGCAACAGGCCAACAGGATTGGTTAATCGTGTTGCCAATCGAG
The germ_2 OAF  ACCGGATCACTTGACCGTTTCTCTATTGGAAGGCAACAGGCCAACAGGATTGGTTAATCGGGTTGCCAATCGAG
The pilo37 OAF  ACCGGATCACTTGACCGTTTCTCTATCGGAAGGCAACAGGCCAACAGGATTGGTTAATCGTGTTGCCAATCGAG
The sanc29 OAF  --------------------------------GCAACAGGCCAACAGGAGGGGTTAAGTGTGGCCCCAAGAGAG
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Input data matrix (continued):

```
                  55555555555555555555555555555555555555555555555555555555555555555555555555
                  12222222222333333333344444444445555555555666666666677777777778888888888999
Taxon/Node        90123456789012345678901234567890123456789012345678901234567890123456789012
--------------------------------------------------------------------------------------------
Cycl esqui S C    AATCCGTCAATTTGAGTATAAATGAACTGTTAGTTGTCGAGTATTACTCCCGCAAAGCTTAATTATCACTTATC
Cycl arida S C    AATCCGTCAATTTGAGTATAAATGAACTGTTAGTTGTCGAGTATTACTCCCGCAAAGCCTAATTATCACTTATC
Cycl hispi S C    AATCCGTCAATTTGAGTATAAATGAACTGTTAGTTGTCGAGTATTACTCCCGCAAAGCTTAATTATCACTTATC
Ch augesce S C    AATCCGTCAATTTGAGTATAAATGAACTGTTAGTTGTCGAGTATTACTCCCGCAAAGCTTAATTATCACTTATC
Cycl inter S C    AATCCGTCAATTTGAGTATAAATGAACTGTTAGTTGTCGAGTATTACTCCCGCAAAGCTTAATTATCACTTATC
Cycl griff S C    AATCCGTCAATTTGGATGTAAATGAATTGTTCGTCGTTGAGTATTACTCCCGCAAAGCTTAA------------
Gl erubesc S C    AATCCGTCAATTTGAGTATAAATGAACTGTTAGTTGTTGAGTATTACTCCCGCAAAGCTTAATTATCACTTATC
Go poitean S C    AATCCGTCAATTTGAGTATAAATGAACTGCTAGTTGTCGAGTATTACTCCCGCAAAGCTTAATTATCATTTATC
Cycl totto S C    AATCCGTCAATTTGGATGTAAATGAATTGTTCGTCGTTGAGTATTACTCCCGCAAAGCTTAA------------
Ma torresi S C    AATCCGTCAATTTGAATATAAATGAATTGTTAGTTGTTGAGTATTACTCCCGCAAAGCTTAATGATTATCTATC
Cycloso sp S C    AATCCGTCAATTTGAGTATAAATGAACTGTTAGTTGTCGAGTATTACTCTCGCAAAGCTTAATTATCACTTATC
Cycl crass S C    AATCCGTCAATTTGAGTATAAATGAACTGTTAGTTGTTGAGTATTACTCTC-----------------------
Metat dayi S C    AATCCGTCAATTTGAATATAAATGAACTGTTAGTTGTNGAGTATTACTCCCGCAAAGCTTAA------------
Na aoristi S C    AATCCGTCAATTTGAGTATAAATGAACTGTTAGTTGTTGAGTATTACCTCCGCAAAGCTTAA------------
The nevade S C    AATCCGTCAATTTGAATATAAATGAATTGTTAGTTGTTGAGTATTACTCCCGCAAAGCTTAATTATCATTTATC
Ph connect S C    AATCCGTCAATTTGAATATAAATGAATTGTTAGTTGTTGAGTATTACTCTCGCAAAGCTTAATGATCATTTATG
Ph decursi S C    AATCCGTCAATTTGAATATAAATGAATTGTTAGTTGTTGAGTATTACTCTCGCAAAGCTTAATGATCATTTATG
Pl archbol S C    AATCCGCCAATTTGGGTTTAAATGAACTGTTAGTTGTCGAGTATTACTCCCGCAAAGCTTAA------------
Pn ecallos S C    AATCCGTCAATTTGAATATAAATGAACTGTTAGTTGTCGAGTATTACTCCCGCAAAGCTTAATTATCACTTATC
Cycl simpl S C    AATCCGTCAATTTGAGTATAAATGAACTGTTAGTTGTCGAGTATTACTCCCGCAAAGCTTAATTATCACTTATC
Psp aurita S C    AATCCGTCAATTTGAATATAAATGAATTGTTAGTTGTCGAGTATTACTCCCGCAAAGCTTAATGATCATCTATC
Sp pennige S C    AATCCGTCAATTTGAGTATAAATGAACTGTTAGTTGTCGAGTATTACTCCCGCAAAGCTTAATTATCACTTATC
Cycl taiwa S C    AATCCGTCAATTTGAATATAAATGAACTGTTAGTTGTCGAGTATTACTCCCGCAAAGCTTAATTATCACTTATC
St leprieu S C    AATCCGNCCATTTGAATATAAATGAACTGTTAGTTGGTGAGTATTACTCTCGCA--------------------
The palust S C    AATCCGTCAATTTGAATATAAATGAATTGTTAGTTGTTGAGTATTACTCCCGCAAAGCTTAATTACCATCTATC
Tr ciliata S C    AATCCGTCAATTTGAGTATAAATGAACTGTTAGTTGTCGAGTATTACTCCCGCAAAGCCTAAGATCCCCTTATC
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Co seemann S C   AATCTGTCAATTTGAATATAAATGAATTGTCAGCTGTCGAGTATTACTCCTGCAAAGCTTAACTATCATTCATC
Cystopteri S C   AATCCGTCAATTTGGATATAAATGAATTGTTGGTTGTTGAGTATTACTCCCGCAAAGCTTAATGATCATTTATT
Gymnocarpi S C   AATCCGTCAATTTGGATATAAATGAGTTGTTAGTTGTTGAGTATTACTCCCGCAAAGCTTAACGATCATCCGTC
Acystopter S C   AATCCGTCAATTTGGATATAAATGAATTGTTGGTCGTTGAGTATTACTCCCGCAAAGCTTAATGATCATTTATC
The oligoc S C   AATCCGTCAATTTGAATATAAATGAATTGTTAGTTGTTGAGTATTACTCCCGCAAAGCTTAA------------
The resi01 OAF   AATCCGTCAATTTGAATATAAATGAATTGTTAGTTGTTGAGTATTACTCCCGCAAAGCTTAATTATCATTTACC
The grac03 OAF   AATCCGTCAATTTGAATATAAATGAATTGTTAGTTGTTGAGTATTACTCCCGCAAAGCTTAATTATAATTTACC
The basi09 OAF   AATCCGTCAATTTGAATATAAATGAATTGTTAGTTGTTGAGTATTACTCCCGCAAAGCTTAATTATCATTTACC
The glan12 OAF   AATCCGTCAATTTGAATATAAATGAATTGTTAGTTGTTGAGTATTACTCCCGCAAAGCTTAATTATCATTTACC
The firm20 OAF   AATCCGTCAATTTGAATATAAATGAATTGTTAGTTGTTGAGTATTACTCCCGCAAAGCTTAATTATCATTTACC
The olig21 OAF   AATCCGTCAATTTGAATATAAATGAATTGTTAGTTGTTGAGTATTACTCCCGCAAAGCTTAATTATCATTTACC
The cora19 OAF   AATCCGTCAATTTGAATATAAATGAATTGTTAGTTGTTGAGTATTACTCCCGCAAAGCTTAATTATCATTTACC
The rudi11 OAF   AATCCGTCAATTTGAATATAAATGAATTGTTAGTTGTTGAGTATTACTCCCGCAAAGCTTAATTATCATTTACC
The hete30 OAF   AATCCGTCAATTTGAATATAAATGAATTGTTAGTTGTTGAGTATTACTCCCGCAAAGCTTAATTATCATTTACC
The glob56 OAF   AATCCGTCAATTTGAATATAAATGAATTGTTAGTTGTTGAGTATTACTCCCGCAAAGCTTAATTATCATTTACC
The amph86 OAF   AATCCGTCAATTTGAATATAAATGAATTGTTAGTTGTTGAGTATTACTCCCGCAAAGCTTAATTATCATTTACC
The balb_L OAF   AATCCGTCAATTTGAATATAAATGAATTGTTAGTTGTTGAGTATTACTCCCGCAAAGCTTAATTATCATTTACC
The balb_B OAF   AATCCGTCAATTTGAATATAAATGAATTGTTAGTTGTTGAGTATTACTCCCGCAAAGCTTAATTATCATTTACC
The cons73 OAF   AATCCGTCAATTTGAATATAAATGAATTGTTAGTTGTTGAGTATTACTCCCGCAAAGCTTAATTATCATTTACC
The germ_1 OAF   AATCCGTCAATTTGAATATAAATGAATTGTTAGTTGTTGAGTATTACTCCCGCAAAGCTTAATG----------
The inab61 OAF   AATCCGTCAATTTGAATATAAATGAATTGTTAGTTGTTGAGTATTACTCCCGCAAAGCTTAATTATCATTTACC
The link59 OAF   AATCCGTCAATTTGAATATAAATGAATTGTTAGTTGTTGAGTATTACTCCCGCAAAGCTTAATTATCATTTACC
The oppo82 OAF   AATCCGTCAATTTGAATATAAATGAATTGTTAGTTGTTGAGTATTACTCCCGCAAAGCTTAATTATCATTTACC
The rose36 OAF   AATCCGTCAATTTGAATATAAATGAATTGTTAGTTGTTGAGTATTACTCCCGCAAAGCTTAATTATCATTTACC
The rufa35 OAF   AATCCGTCAATTTGAATATAAATGAATTGTTAGTTGTTGAGTATTACTCCCGCAAAGCTTAATTATCATTTACC
The rust50 OAF   AATCCGTCAATTTGAATATAAATGAATTGTTAGTTGTTGAGTATTACTCCCGCAAAGCTTAATTATCATTTACC
The germ_2 OAF   AATCCGTCAATTTGAATATAAATGAATTGTTAGTTGTTGAGTATTACTCCCGCAAAGCTTAATG----------
The pilo37 OAF   AATCCGTCAATTTGAATATAAATGAATTGTTAGTTGTTGAGTATTACTCCCGCAAAGCTTAATTATCATTTACC
The sanc29 OAF   AACCCGCCAATTGGAATATAAATGAGTTGTTAGTTGGTGAGTATTACCCCCGCAAAGTTTAATTTTCATTTCCC
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Input data matrix (continued):

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                  5555555666666666666666666666666666666666666666666666666666666666
                  9999999000000000011111111112222222222333333333344444444445555555555666666 6
Taxon/Node        3456789012345678901234567890123456789012345678901234567890123456
----------------------------------------------------------------------------------
Cycl esqui S C    AAATTTTTAATTTAATCAAATAATTT-------GGAGG-TCTCTGCAATGACAAAGAAAATCCAGGCAAAGGGC
Cycl arida S C    AAATTTTTAATTTAATCAAA--------------------------------------------
Cycl hispi S C    AAATTTTTAATTTAATCAAATAATTT-------GGAGG-TCTCTGCAATGACAAAGAAAACCCAGGCAAAGGGC
Ch augesce S C    AAATTTTTAATTTAGTCAAATAAATT-------GGAGG-TCTCTGCAATGACAAAGAAAACCCAGGCAAGGGGC
Cycl inter S C    AAATTTTTAATTTAATCAAATAATTT-------GGAGGGTCTCTGCAATGACAAAG-AAACCCAGGCAAGGGGG
Cycl griff S C    ----------------------------------------------------------------
Gl erubesc S C    AAGTTTTTAATTTAATCAAATAATTT-------GGAGG-TCTCTGCAATGACAAAGAAAACCCAGGCAAAGGGC
Go poitean S C    AAATTTTTAATTTAATCAAATAATTT-------GGAGG-TCTCTGCGATGACAAAGAAAACCCAGGCAAAGGGC
Cycl totto S C    ----------------------------------------------------------------
Ma torresi S C    AAATTTTTAATTTAATTAAATAATTT-------GGAGG-TCTCTACAATGAAAATGAAAATCCAGGCAAAGGAC
Cycloso sp S C    AAATTTTTCATTTAATCAAATAATTT-------GGAGG-TCTCTGCAATGACAAAGAAAACCCAAGCAAAGGGC
Cycl crass S C    ----------------------------------------------------------------
Metat dayi S C    ----------------------------------------------------------------
Na aoristi S C    ----------------------------------------------------------------
The nevade S C    AAATTTTTAATTTAATCGAATAATTT-------GGAGG-TCTCTGCAATGACAATGAAAACCCAGGCAAAGGGC
Ph connect S C    AAATTTCTAATTTAATCAAATAATTG-------GGAGG-TCTNTACGATGAAAACGAAAACCCAGGCAAAGGAC
Ph decursi S C    AAATTTTTAATTTAATTAAATAATTC-------GGAGG-TCTCTATGATGAAAACGGAAACCCAGGCAAAGGAC
Pl archbol S C    ----------------------------------------------------------------
Pn ecallos S C    AAATTTTTAATTTAATCAAATAATTT-------GGAGG-TCTCTGCAATGACAAAGAAAACCCAGGCAAAGGGC
Cycl simpl S C    GAATTTTTAATTTAATCAAATAATTT-------GGAGG-TCTCTGTAATGACAAAGAAAACCTAGGCAAAGGGC
Psp aurita S C    AAATTTTTAATTTAATCAAATAATTT-------GGAGG-TCTCTAGGATGGAAATGAAAACCCAGGCGAAGGGC
Sp pennige S C    AGATTTTTAATTTAATCAAATAATTT-------GGAGG-TCTCTGCAATGACAAAGAAAACCCAGGCAAAGGGC
Cycl taiwa S C    AAATTTTTAATTTAATCAAATAATTT-------GGAGG-TCTCTGCAATGACAAAGAAAACCCAGGCAAAGGGC
St leprieu S C    ----------------------------------------------------------------
The palust S C    GAATTTTCAATTTAATCGAATAATTT-------GTAGG-TTTCTGCAATGGCAATGGAAACCCAGGCAAAGGGC
Tr ciliata S C    NAATTTTTAATTTAATCAAATAATTT-------GGGGG-TCTCTGCAATGNCAAAGAAAACCCAGGCAAAAGGC
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Co seemann S C  GAATTTTTAA------------------------------------------------AA-CCAGGCAAAGGGC
Cystopteri S C  AAATTAAAAATTTAATGAAATAATTT-------GGAAG-CCTCTACAATG------AAAACCCAGGTAAAAGAC
Gymnocarpi S C  AAAGTTTTAGTTTAATCAAATAATTT-------GGAAG-CCTCTACAATG------GAAATTCAGGCAAAGGAC
Acystopter S C  AAATTAGAAATTTAATCAAATAATTT-------GGAAG-CCTCTACAATG------AAAATCCAGGTAAAGGAC
The oligoc S C  --------------------------------------------------------------------------
The resi01 OAF  AAATTTTTAATTTAATCGAATAATTT-------GGAGG-TCTCTGCAATGACAATCAAAACCCAGGCAAAGGGC
The grac03 OAF  AAATTTTTAATTTAATCTAATAATTT-------GGAGG-TCTCTGCAATGACAATGGAAACCCAGACAAAGGGC
The basi09 OAF  AAATTTTTAATTTAATCGAATAATTT-------GGAGG-TCTCTGCAATGACAACGAAAACCCAGGCAAAGGGC
The glan12 OAF  AAATTTTTAATTTAATCGAATAATTT-------GGAGG-TCTCTGCAATGACAATGGAAACCCAGGCAAAGGGC
The firm20 OAF  AAATTTTTAATTTAATCGAATAATTT-------GGAGG-TCTCTGCAATGACAACGGAAACCCAGGCAAAGGGC
The olig21 OAF  AAATTTTTAATTTAATCGAATAATTT-------GGAGG-TCTCTGCAATGACAATGGAAACCCAGGCAAAGGGC
The cora19 OAF  AAATTTTTAATTTAATCTAATAATTT-------GGAGG-TCTCTGCAATGACAATGGAAACCCAGGCAAAGGGC
The rudi11 OAF  AAATTTTTAATTTAATCTAATAATTT-------GGAGG-TCTCTGCAATGACAATGGAAACCCAGGCAAAGGGC
The hete30 OAF  AAATTTTTAATTTAATCTAATAATTT-------GGAGG-TCTCTGCAATGACAATGGAAACCCAGACAAAGGGC
The glob56 OAF  AAATTTTTAATTTAATCAAATAATTT-------GGAAG-TCTCTGCAATGACAATGAAAACCCAGGCAAAGGGC
The amph86 OAF  AAATTTTTAATTTAATCGAATAATTTGTAATTTGGAGG-TCTCTGCAATGACAATCAAAACCCAGGCAAAGGGC
The balb_L OAF  AAATTTTTAATTTAATCGAATAATTT-------GGAGG-TCTCTGCAATGACAATCAAAACCCAGGCAAAGGGC
The balb_B OAF  AAATTTTTAATTTAATCGAATAATTT-------GGAGG-TCTCTGCAATGACAATCAAAACCCAGGCAAAGGGC
The cons73 OAF  AAATTTTTAATTTAATCGAATAATTT-------GGAGG-TCTCTGCAATGACAATGAAAACCCAGGCAAAGGGC
The germ_1 OAF  ------------TAATCTAATAATTT-------GGAGG-TCTCTGCAATGACAATGGAAACCCAGGCAAAGGGC
The inab61 OAF  AAATTTTTAATTTAATCTAATAATTT-------GGCGG-TCTCTGCAATGACAATGGAAACCCAGGCAAAGGGC
The link59 OAF  AAATTTTTAATTTAATCTAATAATTT-------GGAGG-TCTCTGCAATGACAATGGAAACCCAGGCAAAGGGC
The oppo82 OAF  AAATTTTTAATTTAATCGAATAATTTGTAATTTGGAGG-TCTCTGCAATGACAATCAAAACCCAGGCAAAGGGC
The rose36 OAF  AAATTTTTAATTTAATCTAATAATTT-------GGAGG-TCTCTGCAATGACAATGGAAACCCAGGCAAAGGGC
The rufa35 OAF  AAATTTTTAATTTAATCGAATAATTT-------GGAGG-TCTCTGCAATGACAATGAAAACCCAGGCAAAGGGT
The rust50 OAF  AAATTTTTAATTTAATCTAATAATTT-------GGAGG-TCTCTGCAATGACAATGGAAACCCAGGCAAAGGGC
The germ_2 OAF  ------------TAATCTAATAATTT-------GGAGG-TCTCTGCAATGACAATGGAAACCCAGGCAAAGGGC
The pilo37 OAF  AAATTTTTAATTTAATCGAATAATTT-------GGAGG-TCTCTGCAATGACAATGGAAACCCAGGCAAAGGGC
The sanc29 OAF  AAATTTTTAATTTAATCGAATAATTG-------GGAGG-TCTTCGCAAAGACAAGGAAACCCCAGGAAAAGGGC
```

Input data matrix (continued):

```
                  66666666666666666666666666666666677777777777777777777777777777777777777777
                  66677777777778888888888999999999900000000001111111111222222222233333333334
Taxon/Node        78901234567890123456789012345678901234567890123456789012345678901234567890
----------------------------------------------------------------------------------------------
Cycl esqui  S C   TTGACATGACGGAATTTAACAAGTAGATTACTCAGGAAGGAAAATAACGAAAGTTTCTTGATCTAGCTTTTTAC
Cycl arida  S C   --------------------------------------------------------------------------
Cycl hispi  S C   TTGACATGACGGAATTTAACAAGTAGATTACTCAGGAAGGAAAAGAACGAAAGTTCCTTGATCTAGCTTTTTAC
Ch augesce  S C   TTGACATGACGGAATTTAACAAGTAGATTACTCGGGAAGGAAAAGAACGAAAGTTCCTTGATCTAGCTTTTTAC
Cycl inter  S C   TTGACATGACGGAATTTAACAAGTAGATTACTCGGGAAGGAAAAGAGCGAAAGTTTCTTGATCTANC-------
Cycl griff  S C   --------------------------------------------------------------------------
Gl erubesc  S C   TTGACATGACGGAATTTAACAAGTAGATTACTCAGGAAGGAAAAGAACGAAAGTTCCTTGATCTAGCTTTTTAC
Go poitean  S C   TTGACATGACGGAATTTAACAAGTAGATTAGTCGGGAAGGAGAGGAGGGAAAGTTCCTCGATATAGCTTTTCGC
Cycl totto  S C   --------------------------------------------------------------------------
Ma torresi  S C   TTGGGATGATGAAATTTAACAAGTAGATTACTCAGAAGAGAAAGTAACGGAAGTTCCTTGGTCTAGCTTGTTAC
Cycloso sp  S C   TTGACATGACGTAATTTAACAAGTAGATTACTCGGGAAGGAAAAGAACAAAAGTTCCTTGATCTAGCTTTTTAC
Cycl crass  S C   --------------------------------------------------------------------------
Metat dayi  S C   --------------------------------------------------------------------------
Na aoristi  S C   --------------------------------------------------------------------------
The nevade  S C   TTGGGATGATGGAATTTAACAAGTAGATTACTCGGGAAGGAAAGTAGCGAAAGTTCCTTAGTCTAACTTTCCAC
Ph connect  S C   TTGGGGTGATGAAATTTAACAAGCGGATTACTCGGAAAGGAAAGTAACAAAAGTTCCTTGGTCTAGCTTGTTAC
Ph decursi  S C   TTGGGATGATGAAATTTAACAAGTGGATTACTCGGAAAAGAAAGTAACAAAAGTTCCTTGGTCTAGCTTGTTAC
Pl archbol  S C   --------------------------------------------------------------------------
Pn ecallos  S C   TTGACATGACGGAATTTAACAAGTAGATTACTCAGGAGANAAAAGGGCGAAAGTTCCTTGATCTAGCTTTTTAC
Cycl simpl  S C   TTGACATGACGGAATTTAACAAGTAGATTACTCAGGAAGGAAAAGAACGAAAGTTCCTTGATCTAGCTTTTTAC
Psp aurita  S C   TTGGGATGATGAAATTTAACAAGTGGATTACTCGGAAAAGAAAGTAACGAAAGTTCCTTGGTCTAGCTTGTC--
Sp pennige  S C   TTGACATGACGGAATTTAACAATTAGATTGCTCCGGAGGGAAAAGAACGAAAGTTCCTTGATCTAGCTTTTTAC
Cycl taiwa  S C   TTGACATGACGGAATTTAACAAGTAGATTACTCCGGAGGGAAAAGAACGAAAGTTCCTTGATCTAGCTTTTTAC
St leprieu  S C   --------------------------------------------------------------------------
The palust  S C   TTGGGATGATAGAATTTAATAAGTAGATTACTCAGGAAAAGAAATAACGAAAGTTCTTTGGTCTAACTTCTTAC
Tr ciliata  S C   TTGACATGGCGGAATTTAATAAGTAGATTACTCAGGAAGGAAAAGAACGAAAGTTCCCTGATTTAGCTTTTTAC
```

```
Co seemann S C   TTGGTATGATGGAATTTAACAAGTAGATTACTCGGGAAAGAAAATAACGAAAGTTCCCCGGTCTAGCTTCTTAC
Cystopteri S C   TTGGGATGATGGATTTTGATAAGTAGATTACT-----AAGAAAATGACGAAAGTTTCTCGGTCTAGCTTNTTAG
Gymnocarpi S C   TTGAGATGATGTAATTTGATAAGCAGATTACTCGG-----AAAATGACGGAAGTTTCTTGGTATAGCTTGTTAC
Acystopter S C   TTGGGGTGATGGATTTTGGTAAGCAGGTTACTCAG-----AAAATGACGAAAGTTTCCTGGTCTAGTTTCTCAC
The oligoc S C   --------------------------------------------------------------------------
The resi01 OAF   TTGGGATGATGGAATTTAGCAAGTAGATTACTCGGGAAGGAAAGTAGCGAAAGTTCCTTAGTCTAACTTTCCAC
The grac03 OAF   TTGGGATGATGGAATTTAGCAAGTAGATTCCTCGGGAAGGAAAGTAGCGAAAGTTCCTTAGTCTAACTTTCCAC
The basi09 OAF   TTGGGATGATGGAATTTAGCAAGTAGATTACTCGGGAAGGAAAGTAGCGAAAGTTCCTTAGTCTAACTTTCCAC
The glan12 OAF   TTGGGATGATGGAATTTAGCAAGTAGATTGCTCGGGAAGGAAAGTAGCGAAAGTTCCTTAGTCTAACTTTCCAC
The firm20 OAF   TTGGGATGATGGAATTTAGCAAGTAGATTACTCGGGAAGGAAAGTAGCGAAAGTTCCTTAGTCTAACTTTCCAC
The olig21 OAF   TTGGGATGATGGAATTTAGCAAGTAGATTACTCGGGAAGGAAAGTAGCGAAAGTTCCTTAGTCTAACTTTCCAC
The cora19 OAF   TTGGGATGATGGAATTTAGCAAGTAGATTCCTCGGGAAGGAAAGTAGCGAAAGTTCCTTAGTCTAACTTTCCAC
The rudi11 OAF   TTGGGATGATGGAATTTAGCAAGTAGATTCCTCGGGAAGGAAAGTAGCGAAAGTTCCTTAGTCTAACTTTCCAC
The hete30 OAF   TTGGGATGATGGAATTTAGCAAGTAGATTCCTCGGGAAGGAAAGTAGGGAAAGTTCCTTAGTCTAACTTTCCAC
The glob56 OAF   TTGGGATGATGGAATTTAGCAAGTAGATTACTCGGGAAGGAAAGTAGCGAAAGTTCCTTAGTCTAACTTTCCAC
The amph86 OAF   TTGGGATGATGGAATTTAGCAAGTAGATTACTCGGGAAGGAAAGTAGCGAAAGTTCCTTAGTCTAACTTTCCAC
The balb_L OAF   TTGGGATGATGGAATTTAGCAAGTAGATTACTCGGGAAGGAAAGTAGCGAAAGTTCCTTAGTCTAACTTTCCAC
The balb_B OAF   TTGGGATGATGGAATTTAGCAAGTAGATTACTCGGGAAGGAAAGTAGCGAAAGTTCCTTAGTCTAACTTTCCAC
The cons73 OAF   TTGGGATGATGGAATTTAGCAAGTAGATTACTTGGGAAGGAAAGTAGCAAAAGTTCCTTAGTCTAACTTTCCAC
The germ_1 OAF   TTGGGATGATGGAATTTAGCAAGTAGATTCCTCGGGAAGGAAAGTAGCGAAAGTTCCTTAGTCTAACTTTCCAC
The inab61 OAF   TTGGGATGATGGAATTTAGCAAGTAGATTCCTCGGGAAGGAAAGTAGCGAAAGTTCCTTAGTCTAACTTTCCAC
The link59 OAF   TTGGGATGATGGAATTTAGCAAGTAGATTCCTCGGGAAGGAAAGTAGCGAAAGTTCCTTAGTCTAACTTTCCAC
The oppo82 OAF   TTGGGATGATGGAATTTAGCAAGTAGATTACTCGGGAAGGAAAGTAGCGAAAGTTCCTTAGTCTAACTTTCCAC
The rose36 OAF   TTGGGATGATGGAATTTAGCAAGTAGATTCCTCGGGAAGGAAAGTAGCGAAAGTTCCTTAGTCTAACTTTCCAC
The rufa35 OAF   TTGGGATGATGGAATTTAGCAAGTAGATTACTCGGGAAGGAAAGTAGCGAAAGTTCCTTAGTCTAACTTTCCAC
The rust50 OAF   TTGGGATGATGGAATTTAGCAAGTAGATTCCTCGGGAAGGAAAGTAGCGAAAGTTCCTTAGTCTAACTTTCCAC
The germ_2 OAF   TTGGGATGATGGAATTTAGCAAGTAGATTCCTCGGGAAGGAAAGTAGCGAAAGTTCCTTAGTCTAACTTTCCAC
The pilo37 OAF   TTGGGATGATGGAATTTAGCAAGTAGATTACTCGGGAAGGAAAGTAGCGAAAGTTCCTTAGTCTAACTTTCCAC
The sanc29 OAF   TTGGGATGAGGGAATTTCACAAGGAGTTTTCTCGGGAAGAAAAGTAGCAAAAGTTCTTTAGTCTAACTTTCCAC
```

Input data matrix (continued):

```
                   77777777777777777777777777777777777777777777777777777777777888888888888888
                   44444444455555555556666666666777777777788888888889999999999000000000011111
Taxon/Node         12345678901234567890123456789012345678901234567890123456789012345678901234
--------------------------------------------------------------------------------------------
Cycl esqui S C     CTCTTTCAACCAGAAATTAACTTAGATTTTCTTACTTTAAAGATAAATCTTCTAG-----TTTTGAGCTATTTA
Cycl arida S C     --------------------------------------------------------------------------
Cycl hispi S C     CTCTTTCAACCAGAAATTAACTTAGATTTTCTTACTTTAGAGATAAATCTTCTAG-----TTTCGAGTTATTTA
Ch augesce S C     CTATTTCAATCAGAAATTAACTTGGATTTTCTTATTTTATAGATAAATCTTCTCG-----TTTCGAGCTATTTA
Cycl inter S C     --------------------------------------------------------------------------
Cycl griff S C     --------------------------------------------------------------------------
Gl erubesc S C     CTCTTTCAATCAGAAATTAACTTAGATTTTCTTGCTTTAGAGATAAATCTTCTAG-----TTTCGAGCTATTTA
Go poitean S C     GTCGTTCGATCAAAAATTAACTTAGATTTTCTTACTTTAGGGAGAAATTTTCTAC-----TTTTGAGCTATTTA
Cycl totto S C     --------------------------------------------------------------------------
Ma torresi S C     TTTCTCCGAACAAAAATTAACTTATAATTTCTCNCTTTAGAGATAAATCTTCTAG-----TTTTGGGCAGTTTA
Cycloso sp S C     CTCTTTCGATCAGAAATTAACTTATATTTTCTCACTTTAGAGATAAATCTTCTAG-----TTTTGAGCTATTTA
Cycl crass S C     --------------------------------------------------------------------------
Metat dayi S C     --------------------------------------------------------------------------
Na aoristi S C     --------------------------------------------------------------------------
The nevade S C     CTCTTTCAACCAAAAATTAACTTAGATTTTATTACTTTGGAGATCAATCTTCTAG-----TTTTGAGCTATTTA
Ph connect S C     TTTCCCCGAGCAAAAATTAACTTACAATTCCTCACTTTAGAGATAAATCTTCTAGTTTCGTTTCGAGCAATTTA
Ph decursi S C     TTTCCCCGAGCAAAAATTAACTTAAAATTCCTCACTTTAGAGATAAATCTTCTAGTTTCGTTTCGAGCAATTTA
Pl archbol S C     --------------------------------------------------------------------------
Pn ecallos S C     CTCTTTCCATCATAAATTAACTTAGATTTTTTTACTTTAGAGATAAATTTTCTAG-----TTTCGAGCTATTTA
Cycl simpl S C     CTCTTTCAATCAGAAATTAACTTAGATTTTCTTACTTTAGAGAGAAATCTTCTAG-----TTTCGAGCTATTTA
Psp aurita S C     --------------------------------------------------------------------------
Sp pennige S C     CTCTTTCAATCAGAAGTTAACTTAGATTTTCTTACTTTAGAGATAAATCTTCTAG-----TTTCGAGCTAGTTA
Cycl taiwa S C     CTCTTTCAATCAGAAATTAACTTAGATTTTCTTACTTTAGAGATAAATCTTCTAG-----TTTCGAGCTATTTA
St leprieu S C     --------------------------------------------------------------------------
The palust S C     TCCTTTCGATGAAAAGTTAGCTTAGAATTTCTTACTTCATAGATAAATCTTCTAG-----CTTCGAGCAATTTA
Tr ciliata S C     CTCTTTCAACCAGAAATTAACTTAGATTTTCTTACTTTAAAGATAAATCTTCTAG-----TTTTGAGCTATTTA
```

```
Co seemann S C  CCCCTTCGATCAAAAATTAACTTAGATTTTATTACTTTAGAGATCAATCTTCTAG-----TTTTTAGCTATTTA
Cystopteri S C  CTTTTTCGAGTAGAAATTAACTTCTAATCTTTCGCTTCAGAGATAAATATTCTAG-----TTTCGAGCNATTTA
Gymnocarpi S C  CTTCTTCGAATAGAAATTAACTTTTAATCTCTCACTTCGGGGGGAAATATTATGA-----TTTTGGGCAATTTA
Acystopter S C  CTTTTTCGAGCAGAAATTAACTTCTAATCTTTCGCTTCGGAAATAAATATCTTAG-----TTTTGAGCAATTTA
The oligoc S C  --------------------------------------------------------------------------
The resi01 OAF  CTCTTTCGACCAAAAATTATCTTAGATTTTATTACTTTGGAGATCAATCTTCTAG-----TTTTGAGCTATTTA
The grac03 OAF  CTCTTTTGACCAAAAATTAAATTAGATTTTATTACTTTGGAGATCAATTTTCTAG-----TTTTGAGCTATTTA
The basi09 OAF  TTCTTTCGACCAAAAATTAACTTAGATTTTATTACTTTGGAGATCAATCTTCTAG-----TTTTGAGCTATTTA
The glan12 OAF  CTCTCTCGACCAAAAATTAACTTAGATTTTATTACTTTGGAGATCAATCTTCTAG-----TTTTGAGCTATTTA
The firm20 OAF  TTTTTTCGACCAAAAATTAACTTAGATTTTATTACTTTGGAGATCAATCTTCTAG-----TTTTGAGCTATTTA
The olig21 OAF  CTCTTTCGACCAAAAATTAACTTAGATTTTATTACTTTGGAGATCAATCTTTTAG-----TTTTGAGCTATTTA
The cora19 OAF  CTCTTTCGACCAAAAATTAACTTAGATTTTATTACTTTGGAGATCAATCTTCTAG-----TTTTGAGCTATTTA
The rudi11 OAF  CTCTTTCGACCAAAAATTAACTTAGATTTTATTACTTTGGAGATCAATCTTCTAG-----TTTTGAGCTATTTA
The hete30 OAF  CTCTTTCGACCAAAAATTAACTTAGATTTTATTACTTTGGAGATCAATCTTCTAG-----TTTTGAGCTATTTA
The glob56 OAF  CTCTTTCGACCAAAAATTAACTTAGATTTTATTACTTTGGAGATCAATCTTCTAG-----TTTTGAGCTATTTA
The amph86 OAF  CTCTTTCGACCAAAAATTAACTTAGATTTTATTACTTTGAAGATCAATTTTCTAG-----TTTTGAGCTATTTT
The balb_L OAF  CTCTTTCGACCAAAAATTATTTAGATTTTATTACTTTGGAGATCAATTTTCTAG-----TTTTGAGCTATTTA
The balb_B OAF  CTCTTTCGACCAAAAATTATCTTAGATTTTATTACTTTGGAGATCAATCTTCTAG-----TTTTGAGCTATTTA
The cons73 OAF  CTATTTCGACCAAAAATTAACTTA------ATTACTTTGGAGATCAATCTTCTAG-----TTTTGAGCTATTTA
The germ_1 OAF  CTCTTTCGACCAAAAATTAACTTAGATTTTATTACTTTGGAGATCAATCTTCTAG-----TTTTGAGCTGTTTA
The inab61 OAF  CTCTTTCGACCAAAAATTAACTTAGATTTTATTACTTTGGAGATCCATCTTCTAG-----TTTTGAGCTATTTA
The link59 OAF  CTCTTTCGACCAAAAATTAAGTTAGATTTTATTACTTTGGAGATCAATCTTCTAG-----TTTTGAGCTATTTA
The oppo82 OAF  CTCTTTCGACCAAAAATTAACTTAGATTTTATTACTTTGAAGATCAATCTTCTAG-----TTTTGAGCTATTTT
The rose36 OAF  CTCTTTCGACCAAAAATTAACTTAGATTTTATTACTTTGGAGATCAATTTTCTAG-----TTTTGAGCTATTTA
The rufa35 OAF  CTCTTTCGACCAAAAATTAACTTAGATTTTATTACTTTGGAGATCAATCTTCTAG-----TTTTGAGCTATTTA
The rust50 OAF  CTCTTTCGACCAAAAATTAACTTAGATTTTATTACTTTGGGGATCAATCTTCTAG-----TTTTGAGCTATTTA
The germ_2 OAF  CTCTTTCGACCAAAAATTAACTTAGATTTTATTACTTTGGAGATCAATCTTCTAG-----TTTTGAGCTGTTTA
The pilo37 OAF  CTCTTTCGACCAAAAATTAACTTAGATTTTATTACTTTGGAGATCAATCTTCTAG-----TTTTGAGCTATTTA
The sanc29 OAF  TTCTTTGGCCCAAAAATTAACTTAGATTTTATTCCTTTGGAGAACAATTTTCTAG-----TTTAGAGCTATTAA
```

Input data matrix (continued):

```
                    88888888888888888888888888888888888888888888888888888888888888888888888888
                    11111222222222233333333334444444444555555555566666666667777777777888888888
Taxon/Node          56789012345678901234567890123456789012345678901234567890123456789012345678
--------------------------------------------------------------------------------------------------
Cycl esqui S C      ATTTGATAAGCGGTGAATTATACGAATCACCAGCCCACGCCGCTTCGACGAAATTTCCAATCAACCAAGGAATT
Cycl arida S C      --------------------------------------------------------------------------
Cycl hispi S C      ATTTGATAAGCGGTGAATTATACGAATCACCAGCCCACGCCGCTTCGACAAAATTTCCAATCAACCAAGGAATT
Ch augesce S C      ATTTGATAAGCGGTGAATTATACGAATCACCAGTCCACGCCGCTTCTACGAAAATTCCAATCAACCAAGGAATT
Cycl inter S C      --------------------------------------------------------------------------
Cycl griff S C      --------------------------------------------------------------------------
Gl erubesc S C      ATTTGATAAGCGGTGAATTATACGAATCACCGGTCCACGCCGCTTCGACGAAATTTCCAATCAACCAAGGAATT
Go poitean S C      ATTTGATAAGCGGTGAATTATACGAATCACCAGCCCACGCCGCTTCGACAAAATTTCCAATCAACCAGGGAANT
Cycl totto S C      --------------------------------------------------------------------------
Ma torresi S C      ATTTGGTACGCGGTGAATTATACGAATCGCCGGTCCCCGTCGTTTCAGCAAAATTACTAATCAACCAAGGAATT
Cycloso sp S C      ATTTGATAAGCGGTGAATTATACGAATCACCGGTACACGTCGCTTCGACGAAATTTTTAATCAACCAAAGAATT
Cycl crass S C      --------------------------------------------------------------------------
Metat dayi S C      --------------------------------------------------------------------------
Na aoristi S C      --------------------------------------------------------------------------
The nevade S C      ATTTGGTACGCGGTGAATTATACGAATCACCGGTCCACGTCGCTTCGACGAAATTTCCAATCAACCAAGGAATT
Ph connect S C      ATTTAGTACGCGGTGAATTATACGAATCACCGGTCCACGTCGCTTAAGCAAAATCCCTAATCAACCAAGGAATT
Ph decursi S C      ATTTAGTACGCGGTGAATTATACGAATCACCGGTCCACGTCGCTTAATAAAAACCCT-AATCAACCAAGGAATT
Pl archbol S C      --------------------------------------------------------------------------
Pn ecallos S C      ATTTGATAAGCGGTGAATTATACGAATCCCCAGGCCACGCCGGTTAGGCGAAATATCCAATCAACCAAGGAATT
Cycl simpl S C      ATTTGATAAGCGGTGAATTATACGAATCACCAGCCCACGCCGCCTCGACGAAATTTCCAATCAACCAAGGAATT
Psp aurita S C      --------------------------------------------------------------------------
Sp pennige S C      ATTTGATAAGCGGTGAATTATATGAATCACCAGCCCACGCCGCTTCGACGAAATTTCCAATCAACCAAGGAATT
Cycl taiwa S C      ATTTGATAAGCGGTGAATTATACGAATCACCAGCCCACGCCGCTTCGACGAAATTTCCAATCAACCAAGGAATT
St leprieu S C      --------------------------------------------------------------------------
The palust S C      ATTTGGTACGCGGTGAATTATACGAATCACCGGTCCACGTCGCTTTAACGAAATTCCTAATCAACCAGGGAATT
Tr ciliata S C      ATTTGATAAGCGGTGAATTATACGAATCCCCAGNCCCCGCTGCTTCGATGAAA---CCAA--------GGAATT
```

```
Co seemann S C   ATTTGGTACTCGGTGAATTATACGAATCACCGATCCACGTCGCTTCGACAAAATTTCTAATCAACCAAGGAATT
Cystopteri S C   ATTTGGNACNCGACGATTTACCCGAATCAACGGTCCACGTCNCCTCAACGAAATTNTCAGTCAA--AAGGGATT
Gymnocarpi S C   TTTTGGTACGCAGTGAATTATCCGAATCACCGGTCCACGTCACTTCAACGAAATTCCCAATCAA--AAGGGATT
Acystopter S C   ATTTGGTACACGACGAATTACTCAAATCACCGGTCCACGTCACTTCAGGGAAATTCCCAGTCAA--AAGGGATT
The oligoc S C   --------------------------------------------------------------------------
The resi01 OAF   ATTTGGTACGCGGTGAATTATACGAATCACCGGTCCACGTCGCTTCGACGAAATTTCCAACCAACCAAGGAGTT
The grac03 OAF   ATTTGGTACGCGGTGAATTATACGAATCACCGGTCCACGTCGCTTTGACGAAATTTCCAACCAACCAAGGAGTT
The basi09 OAF   ATTTGGTACGCGGTGAATTATACGAATCACCGGTCCACGTCGCTTCGACGAAATTTCCAACCAACCAAGGAGTT
The glan12 OAF   ATTTGGTACGCGGTGAATTATACGAATCACCGGTCCACGTCGGTTTGACGAAATTTCCAACCAACCAAGGAGTT
The firm20 OAF   ATTTGGTACGCGGTGAATTATACGAATCACCGGTCCACGTCGCTTCGACGAAATTTCCAACCAACCAAGGAGTT
The olig21 OAF   ATTTGGTATGCGGTGAATTATACGAATCACCGGTCCACGTCGCTTCGACGAAATTTCCAACCAACCAAGGAGTT
The cora19 OAF   ATTTGGGACGCGGTGAATTATAGGAATCACCGGTGCACGTCGGTTTGACGAAATTTCCAACCAACCCAGGAGGT
The rudi11 OAF   ATTTGGTACGCGGTGAATTATACGAATCACCGGTCCACGTCGTTTCGACGAAATTTCCAACCAACCAAGGAGTT
The hete30 OAF   ATTTGGTACGCGGTGAATTATAAGAATCACCGGTTCACGTGGGTTTGAAGAAATTTCCAACCAACCAAGGAGGT
The glob56 OAF   ATTTGGTACGCGGTGAATTATACGAATCACCGGTTTACGTCGCTTTGACGAAATTTCCAACCAACCAAGGAGGT
The amph86 OAF   ATTTGGTACGCGGTGAATTATACGAATCACCGGTTCACGTCGGTTTGACGAAATTTCCAACCAACCAAGGAGTT
The balb_L OAF   ATTTGGTACGCGGTGAATTATAAGAATCCCCGGTCCACGTCGGTTTGACGAAATTTCCAACCCACCAAGGAGTT
The balb_B OAF   ATTTGGTACGCGGTGAATTATACGAATCACCGGTCCACGTCGGTTTGGCGAAATTTCCAACCAACCAAGGAGTT
The cons73 OAF   ATTTGGTACGCGGTGAATTATACGAATCACCGGTCCACGTCGCTTCGACGAAATTTCCAACCAAGCAA----TT
The germ_1 OAF   ATTTGGTACGCGGGGAATTATACGAATCCCCGGTTCCCGTCGGTTTGGCGAAATTTCCAACCCACCAAGGAGTT
The inab61 OAF   ATTTGGTACGCGGTGAATTATACGAATCACCGGTTCCCGTCGGTTTGGCGAAATTTCCAACCCACCAAGGAGTT
The link59 OAF   ATTTGGTACGCGGTGAATTAT-----------------------------------------------------
The oppo82 OAF   ATTTGGTACGCGGTGAATTATACGAATCACCGGTCCACGTCGCTTCGACGAAATTTCCAACCAACCAAGGAGTT
The rose36 OAF   ATTTGGTACGCGGTGAATTATACGAATCACCGGTTCACGTCGGTTTGACGAAATTTCCAACCAACCAAGGAGGT
The rufa35 OAF   ATTTGGTACGCGGTGAATTATACGAATCACCGGTCCACGTCGCTTTGACGAAATTTCCAACCAACCAAGGAGTT
The rust50 OAF   ATTTGGTACGCGGTGAATTATACGAATCACCGGTCCACGTCGCTTCGACGAAATTTCCAACCAACCAAGGAGTT
The germ_2 OAF   ATTTGGTACGCGGTGAATTATAAGAATCCCCGGTTCCCGTCGGTTTGGCGAAATTTCCAACCCACCAAGGAGGT
The pilo37 OAF   ATTTGGTACGCGGTGAATTATACGAATCACCGGTCCACGTCGCTTCGACGAAATTTCCAACCAACCAAGGAGTT
The sanc29 OAF   ATTGGGTACGCGGGGAATTATAAGAATCCCCGGTCCACGTCGTTTTGGAGAAATTTCCCCCCACCCAAGGAGTT
```

Input data matrix (continued):

```
                   88888888888999999999999999999999999999999999999999999999999999999999999999
                   89999999999000000000011111111112222222222333333333344444444445555555555666
Taxon/Node         90123456789012345678901234567890123456789012345678901234567890123456789012
-------------------------------------------------------------------------------------------------
Cycl esqui S C     GCCAATTATTACTGCTCCCAT------GGTCCTTCAATTTTTTTTT---GGACGGCTCTGTTTGAAACCCCGAT
Cycl arida S C     --------------------------------------------------------------------------
Cycl hispi S C     ACCAATTATTACTGCTCTCAT------GGTCCTTCGGTTTTTTTTT---GGACGGCTTCTTTTGAAACCCCGAT
Ch augesce S C     GCCAATTATTATTGCTCCCGT------GGTCTTTCGGCTTTTTTT---CGGACGGCTTGATTTGAAACCCCGAT
Cycl inter S C     --------------------------------------------------------------------------
Cycl griff S C     --------------------------------------------------------------------------
Gl erubesc S C     GCTAAATATTACTGCTCCCAC------GGTCCCTCGGCTTTTTTT----GGAGGGCTTGGTTTGAAACCCCGAT
Go poitean S C     GCCAATTATTGCTGCTCCCGC------GGTCCTTAGGCTTCTCTT---CGGACGGCGTGATTTGAAACCCCGAT
Cycl totto S C     --------------------------------------------------------------------------
Ma torresi S C     GCCAATAATTACTGCTCTATC-GAGATGGTCCTTCGGCTTTTTTTTT--GGNCGGCTTGATTCGAAACCCCGAT
Cycloso sp S C     GCCAATTATTACGGCTCTCGCA------GTCTTTCGGCTTTTTTT---CGGACGGCTTGATTTGAAATCCCAAT
Cycl crass S C     --------------------------------------------------------------------------
Metat dayi S C     --------------------------------------------------------------------------
Na aoristi S C     --------------------------------------------------------------------------
The nevade S C     GCTAATTATTACTGCTTCCAC------GGTCCCTCGGCTTTTTTTT---GGACGGCTTGATTTGAAACCCCGAT
Ph connect S C     GCCAATTATTACTGCTTCTAC-GAGATGGTCCCTCGGCTTTTGTT---CGGACAGCNTGACTTGAAACCCCGAC
Ph decursi S C     GCCAATTATTACTGCTTCTAT-GAGATGGCCCTTCCGCTTTTGTT---CGGACGGCTTGACTTGAAACCCCGAC
Pl archbol S C     --------------------------------------------------------------------------
Pn ecallos S C     GCCCAATATTTCTGCTCCCAT------GGTCCTTCGTTTTTTTTTT----GACGGTTTTGTTTGAAACCCCGAT
Cycl simpl S C     GCCAATTATTACTGCTCCCAT------GGTCCCTCGGCTTTTTTT---CGGACGGCTTGGTTTGAAACCCCGAT
Psp aurita S C     --------------------------------------------------------------------------
Sp pennige S C     GCCAATTATTACTGCTCCCAT------GGTCCTTCGGTTTTTTT-----GGACAGCTTCGTTTGAAACCCCGAT
Cycl taiwa S C     GCCAATTATTACTGCTCCCAT------GGTCCTTCGGTTTTTTTT----GGACAGCTTTGTTTGAAACCCCGAA
St leprieu S C     --------------------------------------------------------------------------
The palust S C     GCCAATTATTACTGCTTCGAC------GGTCCCCCGGCTTTTTTTT--CGGACNNCTTTATTTGAANCCCCGAT
Tr ciliata S C     GCCAATTATTACTGCTCCCAT------GGTCCCTCGGTTTTTTTTTT---GATGGCTCTGTTTGAAACCCCGAT
```

```
Co seemann S C   GCCAATTATTACTGCTTCCAC------GGTCCCTCGGCTTTTTTTT---GGACGGCTT---------------
Cystopteri S C   GCCAATTCGNACTGCTTCTACTGGGATGGTCCTTCGG------------------------------------
Gymnocarpi S C   ACCAATTCCTACTGCTTCTATTGGGATGTTCCTCCGGCTTTGTTT----GGACGGCTTGATTCC---------
Acystopter S C   GCCAATTCGTACTGCTTCTATGGGGATGGTCCTTCGGCTTTTCTTT---GGACGGCTTGNTTTCAAACCCCGAC
The oligoc S C   -------------------------------------------------------------------------
The resi01 OAF   GCTAATTATTACTGCTTTCAC------GGTCCCTCGACTTTTTTTTT-GGACGGCTTGATTCGAAACCCCGAT
The grac03 OAF   GCTAATTATTACTGCTTTCAC------AGTCCTTCGGCTTTTTTTTT-GTACGGCTTGATTCGAAACCCCGAT
The basi09 OAF   GCTAATTATTACTGCT---------------------------------------------------------
The glan12 OAF   GCTAATTATTACTGCTTTCAC------GGTCCTTCGGCTTTTTTTTT-GGACGGCTTGATTCGAAACCCCGAT
The firm20 OAF   GCTAATTATTACTGCTTTCAC------GGTCCTTCGGCTTTTTTTTTTGGACGGCTTGATTTGAAACCCCGAT
The olig21 OAF   GCTAATTATTACTGCTTTCAC------GGTCCTTCGGCTTTTTTTT--GGACGGCTTGCTTCGAAACCCCGAT
The cora19 OAF   GGTAATTAATACTGCTTTCAC------GGTCCTTCGGGTTTTTTTTT-GTACGGCTTGATTCGAAACCCCGAT
The rudi11 OAF   GCTAATTATTACTGCTTTCAC------GGTCCTTCGGCTTTTTTTTT-GTACGGCTTGATTCGAAACCCCGAT
The hete30 OAF   GGTAAATATTAATGCTTTCAC------AGTCCTTTGGGTTTTTTTTTTGTACGGCTTGATTCGAAACCCCGAT
The glob56 OAF   GCTAATTAATACTGCTTTCAC------GGTCCTTCGGCTTTTTTTTT-GGACGGCTTGATTCGAAACCCCGAT
The amph86 OAF   GCTAATTATTACTGCTTTCAC------GGTCCTTTGGCTTTTTTTTT-GGACGGCTTGATTCGAAACCCCGAT
The balb_L OAF   GCTAATTATTACTGCTTTCAC------GGTCCCTCGACTTTTTTTTT-GGACGGCTTGATTCGAAACCCCGAT
The balb_B OAF   GCTAATTATTAATGCTTTCAC------GGTCCCTTGACTTTTTTTTT-GGACGGCTTGATTCGAAACCCCGAT
The cons73 OAF   GCTAATTATTACTGCTTTCAC------GGTCCTTCGGCTTTTTTTT--GGACAGGTTGATTCGAAACCCCGAT
The germ_1 OAF   GCTAATTATTACTGCTTTCAC------GGTCCTTTGGCTTTTTTTTT-GTACGGCTTGATTCGAAACCCCGAT
The inab61 OAF   GCTAATTATTACTGCTTTCAC------GGTCCTTTGGCTTTTTTTTT-GTACGGCTTGATTCGAAACCCCGAT
The link59 OAF   -------------------------------------------------------------------------
The oppo82 OAF   GCTAATTATTACTGCTTTCAC------GGTCCTTCGGCTTTTTTTT--GGACGGCTTGATTCGAAACCCCGAT
The rose36 OAF   GGTAATTATTACTGCTTTCAC------GGTCCTTTGGCTTTTTTTTT-GTACGGCTTGATTCGAAACCCCGAT
The rufa35 OAF   GCTAATTATTACTGCTTTCAC------GGTCCTTTGGCTTTTTTTTT-GGACGGCTTGATTCGAAACCCCGAT
The rust50 OAF   GCTAATTATTACTGCTTTCAC------GGTCCTTCGGCTTTTTTTT--GTACGGCTTGATTCGAAACCCCGAT
The germ_2 OAF   GGTAATTATTACTGCTTTCAC------GGTCCTTTGGCTTTTTTTTT-GTACGGCTTGATTCGAAACCCCGAT
The pilo37 OAF   GCTAATTATTACTGCTTTCAC------GGTCCTTCGGCTTTTTTTT--GGACGGCTTGCTTCGAAACCCCGAT
The sanc29 OAF   GCAAATTATTACGGCTTTCGG------GGCCCTTGGGCTTTTTTTTT-GGACGGCTTGATTTGAAACCCCGAT
```

Input data matrix (continued):

```
                      11111111111111111111111111111111111111
                 99999999999999999999999999999999999900000000000000000000000000000000000000
                 66666667777777777888888888899999999990000000000111111111122222222223333333
Taxon/Node       34567890123456789012345678901234567890123456789012345678901234567890123456
---------------------------------------------------------------------------------------------
Cycl esqui S C   AAC-------------------------GCCCTTCA-TCAACCTATT-CAGGTTGTTTGTATTC-CACAACTTG
Cycl arida S C   --------------------------------------------------------------------------
Cycl hispi S C   AAA------------------------CGGCCCTTAGTTAACCTATT-TAGGTTGTTTGAATTCATACAACTTG
Ch augesce S C   AAC-----------------------GAGCACTTTAGTTAACCC-TTTNA-GTTGTTTGGATTC-CACAACTTG
Cycl inter S C   --------------------------------------------------GGTTGTTTGGATTC-CACAACTTG
Cycl griff S C   ----------------------TTCANNGCCCTCTA-TTGATATATTTCAGGTTGTTTGGATTGACGTAACTTA
Gl erubesc S C   AAC------------------------GGACCTTNA-TTAACCTATTTC-GGTTGTTTGGATTC-CACAACTTG
Go poitean S C   ATC-----------------TTGAACCCTTCCTTTACNTAACCC-TTTGAAGTNGTTTGGATTCACACAACTTG
Cycl totto S C   -----------------------------CCCCTTAATTAATCTATTTCAGGTTGTTTGGATTCACGCAACTTA
Ma torresi S C   TAC-----------------------------------------------------------------------
Cycloso sp S C   AGC-------------------------GACCCTTAATTAACCTATTT-AGGTTGTTTGAATTAACACAACTTG
Cycl crass S C   --------------------------CGGCCCCT-AATTAACCTATTTCAGGTTGTTTGGATTC-CACAACTTG
Metat dayi S C   ---------------------------GGACCTTTA-TTAACCAATTTCAGGTTTTTTGGATTC-CACGA----
Na aoristi S C   --------------------------------------------------------------------------
The nevade S C   CAC----------------------------ACTTAATTAACGAATTTCAGGTTGTTTGGATTC-CACAATTTG
Ph connect S C   TAC----------------------------CTTTAAT-AACC-ATTT-AGGTTGTTTGGATTC-CACAAATTA
Ph decursi S C   TAC-----------------------------------------------------------------------
Pl archbol S C   -------------------------------CTTCAATTAATCTATTCCAGGTTGTTTGGATTCACACAACTTG
Pn ecallos S C   AAC---------------------------------ATTAACCTATTTCAG-TTGTCTGTATTC-CACA-CTTG
Cycl simpl S C   AAC----------------------------------TTAACCTATTTCAGGTTGTTTGGATTCACACAACTTG
Psp aurita S C   --------------------------------------------------------------------------
Sp pennige S C   AAC---------------------------CCTTTAATTAATCCATTTCAGGTTGTTTGGATTC-CACAATTTG
Cycl taiwa S C   AAC-----------------------------------------------------------------------
St leprieu S C   --------------------------------------------------------------------------
The palust S C   TAC----------------------------CTTCAATTAACCTCTT-CAGGTTGTTTGGATTC-CACAACTTG
Tr ciliata S C   AAC-----------------------------------------------------------------------
```

```
Co seemann S C  -------------------------AAGGCCGCTTAATTAATCCATTTTAGGTTGTTTGGATTCACACAATTTG
Cystopteri S C  ----------------------------CGANCTTAATTAACCC-TTTCAGATTGTTCGGATTC-CACAATTTG
Gymnocarpi S C  --------------------------------------------------------------------------
Acystopter S C  TC-------------------------------TTAATT--CGTCTTTCGGGTTGTTTGAATCCCACAAACTGG
The oligoc S C  --------------------------ACCTTCTTTAAT-AACCAATTTCAGGTTGTCTGGGTTCACACAACTTG
The resi01 OAF  CAC-----------------------------------------------------------------------
The grac03 OAF  CAC--------------------------------------TACATTTCAGGTTGTCTGGGTTCACACAACTTG
The basi09 OAF  -----------------------------------------TACATTTCAGGTTGTCTGGGTTCACACAACTTG
The glan12 OAF  CAC--------------------------------------TACATTTCAGGTTGTTTGGGTTCACACAACTTG
The firm20 OAF  CAC-----------------------------------------------------------------------
The olig21 OAF  CAC--------------------------------------TACATTTCAGGTTGTCTGGGTTCACACAACTTG
The cora19 OAF  CAC-----------------------------------------------------------------------
The rudi11 OAF  CAC-------------------------------------------------------------------CTTG
The hete30 OAF  CAC-------------------------------------------------------------------CTTG
The glob56 OAF  CACTTCAAGTCCCTTTATCCCCAACGGGACACTTTAATTAACCAATTTCAGGTTGTTTGGGTTCACACAACTTG
The amph86 OAF  CAC---------CTCTATCCCCAACGAGACAATTTAATTAACCAATTTTAGGTTGTTTGGGTTCACACAATTTG
The balb_L OAF  CAC----------TTTTTCCCCAAGGGGGAAATTTAATTAATAAATTTTGGATGGTTGGGGGTCCCCAAATTTG
The balb_B OAF  CAC------TCCCTTTTTCCCCAAGGGGGAAAATTAATTAATCAATTTTGGGTGGGTGGGGGTCCCCCAATTTG
The cons73 OAF  CAC-----------CTATCCCCAATGAGACACTTTAATTAACCAATTTCAGGTTGTTTGGATTCACACAATTTG
The germ_1 OAF  CAC-----------CTATCCCCAACGAGACACTTTAATTAACCAATTTCAGGTTGTCTGGGTTCACACAACTCG
The inab61 OAF  CACTTCAAGTTCCTTTATCCCCAACGAGACACTTTAATTAACCAATTTCGGGTTGTCTGGGTTCACACAACTTG
The link59 OAF  ------------CTTTATTCCCAACGGGGCACTTTAATTTACCAATTTCAGGTTGTTTGGGTTCACACAAATTT
The oppo82 OAF  CAC--------------TCCCCAAGGGGCAAATTTAATTACCCAATTTTGGGTGGTTGGGGTTCCCCAAATTTG
The rose36 OAF  CAC----------TTTTTTCCCAAAGGGGCACTTTTATTTACCAATTTTAGGGTGTTTGGGGTTACCCAAATTG
The rufa35 OAF  CAC---------CTTTATTCCCAACGGGGCCCTTTAATTTACCAATTTCAGGGTGTTTGGGTTCACCCAACTTG
The rust50 OAF  CACTTCAAGTCCCTCTATCCCCAACGAGACACTTTAATTAACCAATTTCAGGTTGTCTGGGTTCACACAACCTG
The germ_2 OAF  CACTTCAAGTCCCTCTATCCCCAACGAGACACTTTAATTAACCAATTTCAGGTTGTCTGGGTTCACACAACTCG
The pilo37 OAF  CAC-----------CTATCCCCAACGAGACACTTTAATTAACCAATTTCAGGTTGTCTGGGTTCACACAACTTG
The sanc29 OAF  CAC--------------------------------------TACATTTCAGGTTGTCTGGGTTCACACAACTTG
```

Input data matrix (continued):

```
                    11111111111111111111111111111111111111111111111111111111111111111111111111
                    00000000000000000000000000000000000000000000000000000000000000011111111111
                    33344444444445555555555666666666677777777778888888888999999999900000000001
Taxon/Node          78901234567890123456789012345678901234567890123456789012345678901234567890
----------------------------------------------------------------------------------------------
Cycl esqui S C      T-------TTGGAAGCAAAAA----ACGGAAGCCATTTCAAACCTTTCTTC---GCCTTTTGGTCTTTCCAAAA
Cycl arida S C      --------------------------------------------------------------------------
Cycl hispi S C      T-------TTGGAAGCAAAAA----ATGCAAGCCATTTCAACCTTTTCTTC---GCTTT-TGGTCTTTCCAAAA
Ch augesce S C      T-------TCGGA-GCAAAAT----ACGGAAGCCACTTCAACTTCTTCTTCTCCGCCTT-TGGTCTCTCCAAAA
Cycl inter S C      T-------TTGGAAGCAAAAA----ACGGAAGCCATT-CAAACTTTTCTTC---GCCTT-TGGTCTTTCCAAAA
Cycl griff S C      T-------TCGAAAGCAGAGC----ACGGAAGCCACTTACATCGTGTTT-----GCCTC-TGGCCTTTCCAAAA
Gl erubesc S C      T-------TTGGAACCAAAAT----ATGGAAGCCATTTCAAATTTTTCTTC---GCCTT-TGGTCTTTCCAAAA
Go poitean S C      T-------TCGGA-GCAAAAT----ACGGAAGCCACTTCAACTTCTTCTTCTCCGCCTT-TGGTCTCTCCAAAA
Cycl totto S C      T-------TCGGAAGC------------------CACTTCAATTTTTTTTT---GCCTC-TGGTCTTTCCAAAA
Ma torresi S C      --------------------------------------------------------------------------
Cycloso sp S C      T-------TCGGAAGCAAAAT----ATGGAAGCCACTTCAAATTTTTTCT----GCCTT-TGGTCTTTCCAAAA
Cycl crass S C      T-------TTGGAAGCAAAAT----ATGGAAGCCACTTCAATTTTTTCCT----GCCTT-TGGTCTTTCCAAAA
Metat dayi S C      --------TCGGAAGCAAAAT----GCGGAAGCCATTTCAAATTTTTTTTTT--GTCTT-TGGTCTTTCCAAAA
Na aoristi S C      --------------------------------------------------------------------------
The nevade S C      C-------TCGGAAGCAAAAT----ACGGAAGCTGTTTCAATCTTTTTTTT---GTCTT-TGGTCTTTCCAAGA
Ph connect S C      T-------TTGGAAGCGAAAT----ACGGAAACCACTTCAAATTTATTT-----GCCTT-TGGTCTTTCCAAGA
Ph decursi S C      --------------------------------------------------------------------------
Pl archbol S C      T-------TTGGAAGCAAAAA----ACGGAAGGCATTCCAAACCTTTCTTC---GCCTT-TGGTCTTTCCAAAA
Pn ecallos S C      T-------TTGGAAGCAAAAT----ACGGAAGCCATTTCAAATTTTTCTTC---GCCTC-TGGTCTTTCCAAGA
Cycl simpl S C      T-------TTGGAAGCAAAA-----ACGTAAGCCATTTCAAACTTTTCTTC---GTCTT-TGGTCTTTCCAAAA
Psp aurita S C      --------------------------------------------------------------------------
Sp pennige S C      TTACTTGTTCGGAAGCAAAAT----ACGGAAGCCATTTCAATTTCTTTT-----GTCTT-TGGTCTTTCCAAAA
Cycl taiwa S C      --------------------------------------------------------------------------
St leprieu S C      --------------------------------------------------------------------------
The palust S C      T-------TTGGAAGCAAAAA----ACGTAAGCCATTTCAAATTTTTCTTC---GCCTT-TGGTCTTTCCAAAA
Tr ciliata S C      --------------------------------------------------------------------------
```

```
Co seemann S C  T-------TCGGAAGCAAAAT----GTGGAAGCCATTTCAATCTTTTTC-----GTCTT-TGGTCTTTCCAAGA
Cystopteri S C  T-------TCGGAAGCAAAAT----ACGGAAGCCACTTCAATTTATTTT------CTT-TGGTCTTTCCGAAA
Gymnocarpi S C  --------------------------------------------------------------------------
Acystopter S C  T--CCTG-TCGGGAGCAAAATCAGAACGGAAATCGCTTCACTTCTTTTTTT---G-----TGATCTTTCCAAAA
The oligoc S C  C-------TCGGAAGCAAAAT----ACGGAAGCTGTTTCAACTTTTTTTTT---GTCTT-TGATCTTTCCAAAA
The resi01 OAF  --------------------------------------------------------------------------
The grac03 OAF  C-------TCGGAAGCAAAAT----ACGGAAGCTGTTTCAACTTTTTTTTT---GTCTT-TGGTCTTTCCAAAA
The basi09 OAF  C-------TCGGAAGCAAAAT----ACGGAAGCTGTTTCAATTTTTTTTTT----TCTT-TGGTCTTTCCAAAA
The glan12 OAF  C-------TCGGAAGCAAAAT----ACGGAAGCTGTTTCAATTTTTTTTTT---GTCTT-TGGTCTTTCCAAAA
The firm20 OAF  --------------------------------------------------------------------------
The olig21 OAF  C-------TCGGAAGCAAAAT----ACGGAAGCTGTTTCAACTTTTTTTTT---GTCTT-TGATCTTTCCAAAA
The cora19 OAF  --------------------------------------------------------------------------
The rudi11 OAF  C-------TCGGAAGCAAA-T----GCGGAAGCTTATTCAACTTTTGTTTT---GTCTT-TGGTATTTCCAAAA
The hete30 OAF  C-------TCGGAAGCAAAAT----ACCGAAGCTGTTTCAACTTTTTTTTT---GTCTT-TGGTCTTTCCAAAA
The glob56 OAF  C-------TTGGAAGCAAAAT----ACGGAAGCTGTTTCAATTTTTTTTTTT--GTCTT-TGGTCTTTCCAAAA
The amph86 OAF  C-------TCGGAAGCAAAAT----ACGGAAGCTGTTTCAATTTTTTTT-----GTTT--TGGTCTTTCCAAAA
The balb_L OAF  T-------TGGGAAGAAAAAA----AGGGAAGGGGTTTAAATTTTTTTTTTTT------TGGGTTTTTCCAAAA
The balb_B OAF  T-------TTGGAAAAAAAAA----AAGGAAAGGTTTTCAATTTTTTTTTTTT------TGGGGTTTTCCAAAA
The cons73 OAF  C-------TTGGAAGCAAAAT----ACGGAAGCTGTTTCAATTTTTTTTTTT--GTCTT-TGGTCTTTCCAAAA
The germ_1 OAF  C-------TCGGAAGTAAAAT----ACGGAAGCTTTTTCAACTTTTTTTTT---GTCTT-TGGTCTTTCCAAAA
The inab61 OAF  C-------TCGGAAGCAAAAT----ACGGAAGCTGTTTCAACTTTTTTTTT---GTCTT-TGGTCTTTCCAAAA
The link59 OAF  C-------TTGGAAGCAAAAA----ACGGAAGGTTTTTAACTTTTTTTTT---GTTTT-TGGTCTTTCCAAAA
The oppo82 OAF  T-------TGGGAACAAAAAT----AGGGAAGCGGTTCAAATTTTTTTTTTT-------TGGGTTTTTCCAAAC
The rose36 OAF  G-------TTGGAAACAAAAA----AAGGGAAGTGTTTTAAATTTTTTTTTT--GTTTT-TGGTCTTTTCAAAA
The rufa35 OAF  C-------TTGGAAGCAAAAT----ACGGAAGGTGTTTCAATTTTTTTTTTTT--TCTT-TGGTCTTTCCAAAA
The rust50 OAF  C-------TCGGAAGCAAAAT----ACGGAAGCTGTTTCAACTTTTTTTTT---GTCTT-TGGTCTTTCCAAAA
The germ_2 OAF  C-------TCGGAAGTAAAAT----ACGGAAGCTTTTTCAACTTTTTTTTT---GTCTT-TGGTCTTTCCAAAA
The pilo37 OAF  C-------TCGGAAGCAAAAT----ACGGAAGCTGTTTCAACTTTTTTTTT---GTCTT-TGATCTTTCCAAAA
The sanc29 OAF  C-------TCGGAAGCAAAAT----ACGGAAGCTGTTTCAATTTTTTTTT----GGCYT-TGGKCTTTCCAAAA
```

Input data matrix (continued):

```
                  11111111111111111111111111111111111111111111111111111111111111111111111111
                  11111111111111111111111111111111111111111111111111111111111111111111111111
                  11111111122222222223333333333444444444455555555556666666666777777777788888
Taxon/Node        12345678901234567890123456789012345678901234567890123456789012345678901234
----------------------------------------------------------------------------------------------
Cycl esqui S C    CACTTTGCAATT-GAGCCATTCAGGCTTTTAATATACATGAATGGCTCAATTGAGCCCC---------CCCTAC
Cycl arida S C    --------------------------------------------------------------------------
Cycl hispi S C    CACTTTGCAATT-GAGCCATTCAGGCTTTTAATATACATGAATGGCTCAATTGAGCCCCCCCCC----CCTCAG
Ch augesce S C    CATTTTGCAATT-GAGCCATTCAGGCTTTTAATATACATGAATGGCTCAATTGAGCCCCCC-------CTCTAG
Cycl inter S C    AACTTTGCAATT-GAGCCATTCAGGCTTTTAATATACATGAATGGCTCAATTGAGCCCCCC-------CCCTAT
Cycl griff S C    AACTTTGCAATT-GAGCCATTCAGAATTTTAATATACATGAATGGCTCAACTGA-CCCCCCCCC----CCCTAA
Gl erubesc S C    CACTTTGCAATT-GAGCCATTCAGGCTTTTAATATACATGAATGGCTCAATTGAGCCCCCCCCC--------AG
Go poitean S C    CATTTTGCAATT-GAGCCATTCAGGCTTTTAATATACATGAATGGCTCAATTGAGCCCCCC-------CTCTAG
Cycl totto S C    AACTTTGCAATT-GAGCCATTCAGAATTTTAATATACATGAATGGCTCAACTGA-CCCCCACCCC-------AG
Ma torresi S C    --------------------------------------------------------------------------
Cycloso sp S C    CACTTTGCAATT-GAGCCATTCAGGCTTTTAATATACATGAATGGCTCAATTGAGTCCTCCCCCC-CTCTCTAT
Cycl crass S C    CACTTTGCAATT-GAGCCATTCAGGCTTTTAATATACATGAATGGCTCAATTGAGCCCCCCCCCCCCCCTCCAA
Metat dayi S C    CACTTTGCAAGT-GAGCCATTCAGGCTTTTAATATAAATGAATGGCTCAATCGAGCCCCCCCCCCCCCCCCC--
Na aoristi S C    --------------------------------------------------------------------------
The nevade S C    CACTTTGCAAGT-GAGCCATTCAGGCTTTTAATATACATGAATGGCTCAATCGAGCCCCCCCCCCC--GTCTAG
Ph connect S C    CACTTTGCAGGT-GAGCCATTCAGG----------ACATGAATGGCTCAATCGAGCCCCCCGC-----CTCTAG
Ph decursi S C    --------------------------------------------------------------------------
Pl archbol S C    CACTTTGCAATT-GAGCCATTCAGG-TTTTAATATACATGAATGGCTCAATTGAGCCCTCCC------CCCTAG
Pn ecallos S C    CACTTTGCGATT-GAGCCATTCAGGCTTTTAATATACATGAATGGCTCAATTGAGCCCCCCCC-----CTCCAG
Cycl simpl S C    AACTTTGCAATT-GAGCCATTCAGGCTTTTAATATACATGAATGGCTCAATTGAGCCCCCCCCCCC--CCTCAG
Psp aurita S C    --------------------------------------------------------------------------
Sp pennige S C    CACTTTGCAAGT-GAGCCATTCAGGCTTTTAATATACATGAATGGCTCAATCGAGCCCCCCCCCC---CTCTAG
Cycl taiwa S C    --------------------------------------------------------------------------
St leprieu S C    --------------------------------------------------------------------------
The palust S C    CACTTTGCAATT-GAGCCATTCATGTATATTAGAAGCCTGAATGGCTCAATTGAGACCCCCCC-------TCAG
Tr ciliata S C    --------------------------------------------------------------------------
```

```
Co seemann S C   TACTTTATAAGT-GAGCCATTCAAGCTTTTCATATACATGAATGGCTCAACCGAGCCCCCCCCC----CTCTAG
Cystopteri S C   CACTTTGCAGGT-GAGCCATTCAGGCTTTTAATATACGTGAATGGCTCAGTCGAGCCCCCTCCCC---CTCCAG
Gymnocarpi S C   --------------------------------------------------------------------------
Acystopter S C   CACTTTGCAAGT-GAGCCATTCAGGCTTTTAATATGCATGAATGGCTCAATCGAGCCCCCTCC---------AG
The oligoc S C   CACTTTGCAAGN-GAGCCATTCAGGCTTTTAATATACATGAATGGCTCAATCGAGCCCCCCCCCCCCCCCTT--
The resi01 OAF   --------------------------------------------------------------------------
The grac03 OAF   CACTTTGCAAGT-GAGCCATTCAGGCTTTTAATATACATGAATGGCTCAATCGAGCCCCCCCCCC----TCTAG
The basi09 OAF   CACTTTGCAAGT-GAGCCATTCAGGCTTTTAATATACATGAATGGCTCAATCGAGCCCCCCCCCC----TCTAG
The glan12 OAF   CACTTTGCAAGT-GAGCCATTCAGGCTTTTAATATACATGAATGGCTCAATCGAGCCCCCCCCC-----TCTAG
The firm20 OAF   --------------------------------------------------------------------------
The olig21 OAF   CACTTTGCAAGT-GAGCCATTCAGGCTTTTAATATACATGAATGGCTCAATCGAGCCCCCCCCCC---------
The cora19 OAF   --------------------------------------------------------------------------
The rudi11 OAF   CACTTTGCAAGT-GAGCCATTCAGGCTTTTAATATACATGAATGGCTCAATCAAGCCCCCCCCCC----TCTAG
The hete30 OAF   CACTTTGCACGT-GAGCCATTCAGGCTTTTAATATACATGAATGGCTCAATCGAGCCCCCCCCCC----TCTAG
The glob56 OAF   CACTTTGCAAGT-GAGCCATTCAGGCTTTTAATATACATGAATGGCTCAATCGAGCCCCCCCCC-----TCTAG
The amph86 OAF   CACTTTGCAAGT-GAGCCATTCACGCTTTTAATATACATGAATGGCTCAATCGAGCCCCCCCCC-----GGTAG
The balb_L OAF   CCCTTTGAAAGG-GGGCCCTTCGGGTTTTTAAAAACCAGGAAGGGGCCAATGGGGCCCCCCCCCCCCC-TCTAG
The balb_B OAF   CCCTTTGAAAAG-GGCCCCTTCGGGTTTTTAAAAAAAAAGAAGGGGCCAAAGGAGCCCCCCCCCCCCC-TCTAG
The cons73 OAF   CACTTTGCAAGT-GAGCCATTCAGGCTTTTAATATACATGAATGGCTCAATCGAGCCCCCC----CTCCTCTAG
The germ_1 OAF   CACTTTGCAAGTTGAGCCATTCAGGCTTTTAATATACATGAATGGCTCAATCGAGCCCCCCCCC-----TATAG
The inab61 OAF   CACTTTGCAAGT-GAGCCATTCAGGCTTTTAATATACATGAATGGCTCAATCAAGCCCCCCCCC-----TCTAG
The link59 OAF   CCCTTTGTAAGT-GAGCCCTTCAGGCTTTTAATATATATGAAAGGCTCAATAAAGCCCCCCCCCC----TTTAG
The oppo82 OAF   CCTTTTCAAAGG-GACCCATTCCCCTTTTTAAAAACCAGAAAGGGTCCAATGGGCCCCCCCCCCCCC--GGTAG
The rose36 OAF   CACTTTGCAAGT-GAGCCATTCAGGGTTTTAATATACATGAAAGGGTCAATCAAGCCCCCCCCCC----TTTAG
The rufa35 OAF   CACTTTGCAAGT-GAGCCATTCAGGCTTTTAATATACATGAATGGCTCAATCGAGCCCCCCCCCC----TCTAG
The rust50 OAF   CACTTTGCAGGT-GAGCCATTCAGGCTTTTAATATACATGAATGGCTCAATCGAGCCCCCCCCC-----TCTAG
The germ_2 OAF   CACTTTGCAAGTTGAGCCATTCAGGCTTTTAATATACATGAATGGCTCAATCGAGCCCCCCCCC-----TATAG
The pilo37 OAF   CACTTTGCAAGT-GAGCCATTCAGGCTTTTAATATACATGAATGGCTCAATCGAGCCCCCCCCCC----TCTAG
The sanc29 OAF   CAMTTTGCAAGK-GARCCATTCMGGSTTTTAATATACATGAATGGSTCAATTGARCCCCCCCCCC----TCTAG
```

Input data matrix (continued):

```
                   11111111111111111111111111111111111111111111111111111111111111111111111111
                   11111111111111122222222222222222222222222222222222222222222222222222222222
                   88888999999999900000000001111111111222222222233333333334444444444555555555
Taxon/Node         56789012345678901234567890123456789012345678901234567890123456789012345678
-------------------------------------------------------------------------------------------
Cycl esqui S C     TTTT-------ACTTTATTTACTGGAAG-AATATTG-------CATTAAACAGGTCGATAAAGGCGAGACCAAC
Cycl arida S C     --------------------------------------------------------------------------
Cycl hispi S C     TAT--------ACTTTATTTACTGGAAGCAATATTG-------CATTAAAAAGGTCGATAAAGGCGAGATCAAC
Ch augesce S C     -----------ACTTTATTTACTGGAAGCAATGTTG-------TATCAAAAAGGTCGATAAAGGCGAAATGAAC
Cycl inter S C     TAT--------ACTTTATTTACTGGAAGCAATATTG-------CATTAAACAGGTCGATAAAGGCGAGACCAAC
Cycl griff S C     -----------ACTTCATTCACCGGAGGCAATATTT-------TATTAACCAGGTCGATAAAGGCGAGATAACC
Gl erubesc S C     TAT--------ACTTTAGTTACTGGAAGCAATATTG-------TATTAAACAGGTCGATAAAGGCGAGATCGAC
Go poitean S C     -----------ACTTTATTTACTGGAAGCAATGTTG-------TATCAAAAAGGTCGATAAAGGCGAAATGAAC
Cycl totto S C     -----------ACTTTACTCACCGGAGGCAATATTG-------TATTAAACAGGTCGATAAAGGCGAGATAAGC
Ma torresi S C     --------------------------------------------------------------------------
Cycloso sp S C     -----------ACGTTATTTACTGGAACTAATATTG-------TATTAAACAGGTCGATAAAGGCGAGATCAAC
Cycl crass S C     -----------ACTTTTTTT-CTGGGGCCAATTTTGG------T-TTAAACAGGGCGATAAAGGCGAAATCGAC
Metat dayi S C     --------------------------------------------------------------------------
Na aoristi S C     --------------------------------------------------------------------------
The nevade S C     -----------ACTTTA-TTACTGGATACAATATTG-------CATCAAACAGATCGATAAGGGCGAGATCACC
Ph connect S C     -----------ATTTTATTAGCTGGAAGCAATATTGGGTTAAGTATTAAGCAGGTCGATAAAGGCGAGA----C
Ph decursi S C     --------------------------------------------------------------------------
Pl archbol S C     TAT--------ACTTTATTTACTGGAAGCAATATTG-------CATTAAACAGGTCGATAAAGGCGAGACCAAC
Pn ecallos S C     TAT--------ACCTTATTTACTGGAAGCAATATTG-------CATCAAACAGGTCGATAAAGGCAAGATCAAC
Cycl simpl S C     TGT--------ACTTTATTTACTGGAAGCAATATTG-------CATCAAACAGGTCGATAAAGGCGAAACTAAC
Psp aurita S C     --------------------------------------------------------------------------
Sp pennige S C     -----------ACTTTATTTACTGGGAGCGATATTG-------TATCAAACAGGTCGATGAAGGCCAGATCAAC
Cycl taiwa S C     --------------------------------------------------------------------------
St leprieu S C     --------------------------------------------------------------------------
The palust S C     TATACTTGTATACTTTATTTACTGGAAACAATATTG-------CATCAAACAGGTCGATAAAGGCGAGACCAAC
Tr ciliata S C     --------------------------------------------------------------------------
```

```
Co seemann S C   ---ACTT-TACTTATTATTTACCAGAGGCAATATTG-------CATCGAGCAGATCGATAGAGGCGGGATCAAC
Cystopteri S C   -----------ACTTTATTTACCGGAAGCGATATTG-------TGTTAAACAGGTCGACGAAGGCGAGATCAAC
Gymnocarpi S C   --------------------------------------------------------------------------
Acystopter S C   ---ACTT-TATTATTTATTAACTGGAAGCAATATTG-------TATTAAACAGATCGATGAAGACGAAATCAGC
The oligoc S C   --------------------------------------------------------------------------
The resi01 OAF   --------------------------------------------------------------------------
The grac03 OAF   -----------ACTTTATTTACCGGATATAATATTG-------TATCAAACAGATCGATAAAGGCGAGATCAAC
The basi09 OAF   -----------ACTTTATTTACCAGATATAATGTTG-------TATCAAACAGATCGATAAAGGCGAGATCAAC
The glan12 OAF   -----------ACTTTATTTACCGGATATAATATTG-------TATCAAACAGATCGATAAAGGCGAGATCGAC
The firm20 OAF   --------------------------------------------------------------------------
The olig21 OAF   --------------------------------------------------------------------------
The cora19 OAF   --------------------------------------------------------------------------
The rudi11 OAF   -----------ACTTTATTTACCGGATATAATATTG-------TATCAAACAGATCGATAAAGGCGAGATCAAC
The hete30 OAF   -----------ACTTTATTTACCGGATAAAAAATTG-------TTTCTCCCCCATCTCTCATGGCTAGATCTCC
The glob56 OAF   -----------ACTTTATTTACCGGATATAATATTG-------TATCAAACAGATCGATAAAGGCGAGATCAAC
The amph86 OAF   -----------ACTTTATCTACCGGATATAATATTG-------TATCAAACAGATCGATAAAGGCGAGATCGAC
The balb_L OAF   -----------ACTTTATCTACCGGATATGATATTG-------TATCAAACAGATGGATAAAGGCGAGATCAAC
The balb_B OAF   -----------ACTTTATCTACCGGATATGATATTG-------TATCAAACAGATGGATAAAGGCGAGATCAAC
The cons73 OAF   -----------ACTTTATCTACCGGATATAATATTG-------TATCAAACAGATCGATAAAGGCGAGATCGGC
The germ_1 OAF   -----------ACTTTATTTACCGGATATAATATTG-------TATCAAACAGATCGATAAAGGCGAGATCAAC
The inab61 OAF   -----------ACTTTATTTACCGGATATAATATTG-------TATCAAACAGATCGATAAAGGCGAGATCAAC
The link59 OAF   -----------ACTTTATTTACCGGATATAATATTG-------TATCAAACAGATCGATAAAGGCGAGATCAAC
The oppo82 OAF   -----------ACTTTATCTACCGGATATAATATTG-------TATCAAACAGATCGATAAAGGCGAGATCGAC
The rose36 OAF   -----------ACTTTATTTACCGGATATAATATTG-------TATCAAACAGATCGATAAAGGCGAGATCAAC
The rufa35 OAF   -----------ACTTTATTTACCGGATATAATATTG-------TATCAAACAGATCGATAAAGGCGAGATCGAC
The rust50 OAF   -----------ACTTTATTTACCGGATATAATATTG-------TATCAAACAGATCGATAAAGGCGAGATCAAC
The germ_2 OAF   -----------ACTTTATTTACCGGATATAATATTG-------TATCAAACAGATCGATAAAGGCGAGATCAAC
The pilo37 OAF   -----------ACTTTATTTACCGGATATAATATTG-------TATCAAACAGATCGATAAAGGCGAGATCAAC
The sanc29 OAF   -----------ACTTTATTTACCAGATATAATATTG-------TATCAAACAGATCGATAAAGGCGAGATCAAC
```

Input data matrix (continued):

```
                 11111111111111111111111111111111111111111111111111111111111111111111111111
                 22222222222222222222222222222222222222223333333333333333333333333333333333
                 56666666666777777777788888888889999999999000000000011111111112222222222333
Taxon/Node       90123456789012345678901234567890123456789012345678901234567890123456789012
-------------------------------------------------------------------------------------------
Cycl esqui S C   GG---------TTTGACTAGGCTCCAAAAAAAA---TGGAGTTGAAAAA--TAGACCCAACGAATTTTCAGTTG
Cycl arida S C   --------------------------------------------------------------------------
Cycl hispi S C   GG---------TTTGACTAGGCTCCAAAAAAA----TGGAGTTGAAAAA--TATACTCAACGAATTTTCAGTTG
Ch augesce S C   GG---------TTTGACTAGGCTCCGAAAAAA----TGGAGTTGAAAAA--TATACTCAACGGATTTTCAGTTG
Cycl inter S C   GG---------TTTGACTAGGCTC-AAAAAAA----TGGAGTTGAAGAA--TATACCCAACGAATTTTCAGTTG
Cycl griff S C   GG---------TTTGACTAGGCTCCAAAAAAA--TTTGGAGTTGAAAAAA-TATACTCA-CGGATTTTCAGTGG
Gl erubesc S C   GG---------TTTGACTAGGCTCCAAAAAAA----TGGAGTTGAAAAA--TATACTCAACGGATTTTCAGTTG
Go poitean S C   GG---------TTTGACTAGGCTCCGAAAAAA----TGGAGTTGAAAAA--TATACTCAACGGATTTTCAGTTG
Cycl totto S C   GG---------TTTGACTAGGCTCCGAAAAG---TTTGGAGTTGAAAAAA-TATACTCAACGGATTTTCGGTTG
Ma torresi S C   --------------------------------------------------------------------------
Cycloso sp S C   GG---------TTTGACTAGGCTCCAAAAAAA----TGGAGTTGAAATA--TATACTCAACGGATTTTCAGTTG
Cycl crass S C   GG---------TTTGACTAGGCTCCAAAAAAAA---GGGGGTTGAAAAAA--AAACCCAAGGGATTTTCAGTTG
Metat dayi S C   --------------------------------------------------------------------------
Na aoristi S C   --------------------------------------------------------------------------
The nevade S C   GG---------TTGGACTAGAC---AAAAAA-----TGTAGTTGAA-AA--TTAACCTCACTGATTTTCAGTTG
Ph connect S C   GG---------TTTGACTAGGC---AAAAGA----CTGGAGTTGAAAAA--TATACCTAACTGATTTCTAGTTG
Ph decursi S C   --------------------------------------------------------------------------
Pl archbol S C   GG---------TTTGACTAGGCTCCAAAAAAA----TGGAGTTGAAAAA--TATACTCAACGAATTTTCAGTTG
Pn ecallos S C   AG---------TTTGACTAGGCTCCAGAAAAAAA--TGGAGTTGAAAAA--TATACTCAACGAATTTTCAGTTG
Cycl simpl S C   GG---------TTTGACTAGGCTCCAAAAAAA----TGGAGTTGAAAAA--TATCCTCAACAAATTTTCAGTTG
Psp aurita S C   --------------------------------------------------------------------------
Sp pennige S C   GG---------TTTGACTAGGC---AAAAAAA----TGGAGTTGGAAAA--TATACTTAACTGATTTTTAGTTG
Cycl taiwa S C   --------------------------------------------------------------------------
St leprieu S C   --------------------------------------------------------------------------
The palust S C   GA---------TTTGACTAGGCTCCGAAAAAA----TGGAGTTGAAAAA--TATACTCAACGAATTTTCAGTTG
Tr ciliata S C   --------------------------------------------------------------------------
```

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Co seemann S C  GA---------TTTGACTAGGC---AAAAAAA----TGGAATTGAAAAA--TAAACTCAACTGATTTTCAGTTG
Cystopteri S C  GG---------TTTGACTAGGC---AAGAAG----CTGGAGTTGAAAAA--TAAACTTCACCGATTTCTAGTTG
Gymnocarpi S C  --------------------------------------------------------------------------------
Acystopter S C  GA---------TTTGACTAGGC---AAAAAA----CTGGAGTTGAATAA--TATACCTAACTAATTTTTAGTTG
The oligoc S C  --------------------------------------------------------------------------------
The resi01 OAF  --------------------------------------------------------------------------------
The grac03 OAF  GG---------TTTGACTAGGC---ATTTTTT-ATCT------GAAAAA--TAAACTCAACTGATTTTCAGC--
The basi09 OAF  GG---------TTTGACTAGGC---ATTTTTT-ATCT------GAAAAA--TAAACTCAACTGATTTTCAGC--
The glan12 OAF  GG---------TTTGACTAGAC---ATTTTTT-ATCT------GAAAAA--TAAACTCAACTGATTTTCAGC--
The firm20 OAF  --------------------------------------------------------------------------------
The olig21 OAF  --------------------------------------------------------------------------------
The cora19 OAF  --------------------------------------------------------------------------------
The rudi11 OAF  GG---------TTTGACTAGGC---TTTTTTT-ATCT------GAAAAAAA-AAACTCAACTGATTTTCAGC--
The hete30 OAF  GG---------TTTGACTATGC---ATTTTTT-AGTC------TGAAGAAA-AGCTTCATTGGATTTGCACC--
The glob56 OAF  GG---------TTTGACTAGGC---ATTTTTT-ATCT------GAAAAA--TAAACTCAACTGATTTTCAGC--
The amph86 OAF  GG---------TTTTACTAGGC---ATTTTTT-ATCT------GAAAAA--TAAACTCAACTGATTTTCAGC--
The balb_L OAF  GG---------TTTGACTAGGC---ATTTTTTTATCT------GAAAAA--TAAACTCAACTGATTTTCAGC--
The balb_B OAF  GG---------TTTGACTAGGC---ATTTTTTTATCT------GAAAAA--TAAACTCAACTGATTTTCAGC--
The cons73 OAF  GG---------TTTGACTAGGC---ATTTTTT-ATCT------GAAAAA--TAAACTCAACTGATTTTCAGC--
The germ_1 OAF  GG---------TTTGACTAGGC---ATTTTTT-ATCT------GAAAAA--TAAACTCAACTGATTTTCAGC--
The inab61 OAF  GG---------TTTGACTAGGC---ATTTTTT-ATCT------TAAAAAAA-AAACTCAACTGATTTTCAGC--
The link59 OAF  GG---------TTTGACTAGGC---ATTTTTT-ATCT------GAAAAA--TAAACTCAACTGATTTTCAGC--
The oppo82 OAF  GG---------TTTTACTAGGC---ATTTTTT-ATCT------GAAAAA--TAAACTCAACTGATTTTCAGC--
The rose36 OAF  GG---------TTTGACTAGGC---ATTTTTT-ATTT------GAAAAAAAAAAACTCAACTGATTTTCAGC--
The rufa35 OAF  GG---------TTTGACTAGGC---ATTTTTT-ATCT------GAAAAA--TAAACTCAACTGATTTTCAGC--
The rust50 OAF  GGTTTGAACGGTTTGACTAGGC---ATTTTTT-ATCT------GAAAAA--TAAACTCAACTGATTTTCAGC--
The germ_2 OAF  GG---------TTTGACTAGGC---ATTTTTT-ATCT------GAAAAA--TAAACTCAACTGATTTTCAGC--
The pilo37 OAF  GG---------TTTGACTAGGC---GTTTTTT-ATCT------GAAAAA--TAAACTCAACTGATTTTCAGC--
The sanc29 OAF  GG---------TTTGACTAGGC---ATTTTTT-ATCT------GAAAAA--KAAACTCAACTGATTTTCAGC--
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Input data matrix (continued):

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                 33333334444444444555555555566666666667777777777888888888899999999990000000
Taxon/Node       34567890123456789012345678901234567890123456789012345678901234567890123456
-------------------------------------------------------------------------------------------
Cycl esqui S C   AGTTTTAC------CGTAAATGAATTAGCC-GAGATAGCTCAGTCGGTAGAGCAGAGGACTGAAAATCCTCGTG
Cycl arida S C   --------------------------------------------------------------------------
Cycl hispi S C   AGTTTTAC------CGTAAATGAATTAGCC-GAGATAGCTCAGTCGGTAGAGCAGAGGACTGAAAATCCTCGTG
Ch augesce S C   AGTTTTAC------CGTAGATGCATTAGCC-GAGATAGCTCAGTCGGTAGAGCAGAGGACTGAAAATCCTCGTG
Cycl inter S C   AGTTTTAC------------------------------------------------------------------
Cycl griff S C   AGTTTTAC------CGGAAATGC-TT---------TA-C-C---CGG-A-A--A-AGG--------TCATCG-G
Gl erubesc S C   AGTTTTAC------CGTAAATGCATTAGCC-GAGATAGCTCAGTCGGTAGAGCAGAGGACTGAAAATCCTCGTG
Go poitean S C   AGTTTTAC------CGTAGATGCATTAGCC-GAGATAGCTCAGTCGGTAGAGCAGAGGACTGAAAATCCTCGTG
Cycl totto S C   AGTTTTAC------CGTAGATGCATTAGCC-GAGATAGCTCAGTCGGTAGAGCAGAGGACTGAAAATCCTCGTG
Ma torresi S C   --------------------------------------------------------------------------
Cycloso sp S C   AGTTTTAG------CGTAAATGCACTAGCC-GAGATAGCTCAGTCGGTAAAGCAAAGGACTGAAAATCCTCGTG
Cycl crass S C   GGTTTTAC------CGGAAATGCATTAACC-GGAAAAACTTAATCGGTAAAACAAAGGACTGAAAATCCTTGGG
Metat dayi S C   --------------------------------------------------------------------------
Na aoristi S C   --------------------------------------------------------------------------
The nevade S C   AAT-T--C------CGTAAATGGCTTAACC-GAAATAGCTCAATCGGTAAAGCCAAAGACTGAAATTCCTCGGG
Ph connect S C   ATTTTTAC------CTTAAATGAGTTAGCCCGAGATAGCTCAGTCGGTAGAGCAGAGGACTGAAAATCCTCGTG
Ph decursi S C   --------------------------------------------------------------------------
Pl archbol S C   AGTTTTAC------CGTAAATGCATTAGCC-GAGATAGCTCAGTCGGTAGAGCAGAGGACTGAAAATCCTCGTG
Pn ecallos S C   AGTTTTAC------CGTAAATGCATTAGCC-GAGATAGCTCAGTCGGTAGAGCAGAGGACTGAAAATCCTCGTG
Cycl simpl S C   AGTTTTAC------CGTAAATTAATTACCC-GAAATAGCTCAGTCGGTAAAGCAAAGGACTGAAAATCCTCGGG
Psp aurita S C   --------------------------------------------------------------------------
Sp pennige S C   AGTTTTAC------CGTAAATGCGTTAACC-GAGATAGCTCAATCGGTAAAGCAAAGGACTGAAAATCCTCGTG
Cycl taiwa S C   --------------------------------------------------------------------------
St leprieu S C   --------------------------------------------------------------------------
The palust S C   AGTTTTAC------TGTAAATGAATTAGCC-GAGGTAGCTCAGTCGGTAGAGCAGAGGACTGAAAATCCTCGTG
Tr ciliata S C   --------------------------------------------------------------------------
```

```
Co seemann S C  AGTTTTAC------CGTAAATGCGTTAGCC-GAGATAGCTCAGTCGGTAGAGCAGAGGACTGAAAATCCTCGTG
Cystopteri S C  AGTTTTAC------CGTAAATGAATCGGCC-GAGATAGCTCAGTCGGTAGAGCAGAGGACTGAAAATCCTCGTG
Gymnocarpi S C  --------------------------------------------------------------------------
Acystopter S C  AGTTTTAC------TGCAAATTAGTTGGCC-GAGATAGCTCAGTCGGTAGAGCAGAGGACTGAAAATCCTCGTG
The oligoc S C  --------------------------------------------------------------------------
The resi01 OAF  --------------------------------------------------------------------------
The grac03 OAF  --TTTTCATCCATCTGTAAATGCATTAGCC-GAGATAGCTCAGTCGGTAGAGCAAAGGACTGAAAATCCTCGTG
The basi09 OAF  --TTTTCAT----CTGTAAATGCATTAGCC-GARATAGCTCAKTCGGTAGAGCAAAGGACTGAAAATCCTCGTG
The glan12 OAF  --TTTTCAT----CTGTAAATGCATTAGCC-GAGATAGCTCAGTCGGTAGAGCAAAGGACTGAAAATCCTCGTG
The firm20 OAF  --------------------------------------------------------------------------
The olig21 OAF  --------------------------------------------------------------------------
The cora19 OAF  --------------------------------------------------------------------------
The rudi11 OAF  --TTTTTAT----CTGAAAATGCATTACCC-AAAATAGCTCATTCGGTAAAGCAAAGGACTGAAAATCCTCGGG
The hete30 OAF  --TTTTCATCCATCTGGAAAAGCATAAGCC-TAAATATCTTCGTGTGTACAGCACAGATCTGAAAATCCTCGTG
The glob56 OAF  --TTTTCAT----CTGTAAATGCAT-AGCC-GAG----------------------------------------
The amph86 OAF  --TTTTTAT----CTGTAAATGCAT-AGCC-GA-----------------------------------------
The balb_L OAF  --TTTTTAT----CTCTAAATTCAT-AGCC-GA-----------------------------------------
The balb_B OAF  --TTTTTAT----CTCTAAATTCAT-AGCC-GAG----------------------------------------
The cons73 OAF  --TTTTTAT----CTGTAAATGC---------------------------------------------------
The germ_1 OAF  --TTTTCAT----CTGTAAATGCAT-AGCC-GAGATAG------------------------------------
The inab61 OAF  --TTTTCAT----CTGTAAATGCATTAGCC-GAGAT--------------------------------------
The link59 OAF  --TTTTCAT----CTGTAAATGCAT-AGCC-GAGATAGTC----------------------------------
The oppo82 OAF  --TTTTTAT----CTGTAAATGCAT-AGCC-GAG----------------------------------------
The rose36 OAF  --TTTTCAT----CTGTAAATGCATTAGCC-GAG----------------------------------------
The rufa35 OAF  --TTTTCAT----CTGTAAATGCAT-AGCC-GAG----------------------------------------
The rust50 OAF  --TTTTCAT----CTGTAAATGCAT-AGCC-GAGATAGTC----------------------------------
The germ_2 OAF  --TTTTCAT----CTGTAAATGCAT-AGCC-GAG----------------------------------------
The pilo37 OAF  --TTTTCAT----CTGTAAATGCAT-AGCC-GAG----------------------------------------
The sanc29 OAF  --TTTTCAT----CTGTAAATGCATTAGCC-GAGATAG------------------------------------
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Input data matrix (continued):

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                  0001111111111222
Taxon/Node        7890123456789012
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Cycl arida S C  ----------------
Cycl hispi S C  TCACCAGTTCAAA---
Ch augesce S C  TCACCAGTTCAAA-TA
Cycl inter S C  ----------------
Cycl griff S C  T----AG---A-----
Gl erubesc S C  TCACCAGTT-AAA-TA
Go poitean S C  TCACCAGTTCAA--TA
Cycl totto S C  TCACCAGTT-AAA-AA
Ma torresi S C  ----------------
Cycloso sp S C  TCACCAGTT-AAA-AA
Cycl crass S C  TCCCCAATT-AAA-AA
Metat dayi S C  ----------------
Na aoristi S C  ----------------
The nevade S C  TACCCAGTT-------
Ph connect S C  TCACCAGTTCAAA-TA
Ph decursi S C  ----------------
Pl archbol S C  TCACCAGT-CAAAATA
Pn ecallos S C  TCACCAGTTCAAA-TA
Cycl simpl S C  TCACCAGT-AAAAAAA
Psp aurita S C  ----------------
Sp pennige S C  TCACCAGTTCAAA-AA
Cycl taiwa S C  ----------------
St leprieu S C  ----------------
The palust S C  TCACCAGTTCAAA-TA
Tr ciliata S C  ----------------
```

```
Co seemann S C  TCACCAGTTNAAA-AA
Cystopteri S C  TCACCAGT-CAAA-TA
Gymnocarpi S C  ----------------
Acystopter S C  TCACCAGTTCCAA-TA
The oligoc S C  ----------------
The resi01 OAF  ----------------
The grac03 OAF  TCACCAGTTCAA----
The basi09 OAF  TCACCAGTTCAA----
The glan12 OAF  TCACCAGTTCAA----
The firm20 OAF  ----------------
The olig21 OAF  ----------------
The cora19 OAF  ----------------
The rudi11 OAF  TCACCAGTTAAA----
The hete30 OAF  TCACCAGTTCAA----
The glob56 OAF  ----------------
The amph86 OAF  ----------------
The balb_L OAF  ----------------
The balb_B OAF  ----------------
The cons73 OAF  ----------------
The germ_1 OAF  ----------------
The inab61 OAF  ----------------
The link59 OAF  ----------------
The oppo82 OAF  ----------------
The rose36 OAF  ----------------
The rufa35 OAF  ----------------
The rust50 OAF  ----------------
The germ_2 OAF  ----------------
The pilo37 OAF  ----------------
The sanc29 OAF  ----------------
```

APPENDIX B

Specimens examined

Table 2. Additional specimens examined. Species numbers correspond to the list from Chapter 2. No additional materials other than types were seen for the following taxa: **4b)** *A. rudis* var. *gradata*; **11)** *A. intromissa*; **19)** *A. sellensis*; **29)** *A. basiattenuata*; and **48)** *A. glutinosa*.

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1. ***Amauropelta thomsonii*** (Jenman) Pic. Serm. — **Haiti.** SUD-EST: Massif de la Selle, Marigot, Jardins Bois-Pin, *Ekman H10051* (NY); Massif de la Selle: ca. 3 km E of Seguin on road to Mare Rouge, *Mickel et al. 9357* (NY). **Dominican Republic.** ELIAS PIÑA: Municipio Hondo Valle, Sierra de Neiba. Descendiendo hacia Aniceto Martínez, a 900 m del puesto militar 204, 18°41'27.5" N, 71°46'42.1" O, *Alvarez-Fuentes & Clase 663* (JBSD, MSC).—PEDERNALES: Sierra de Baoruco, 7.2-7.7 km S of ridge top 4.8-5.3 km N of Los Arroyos on Jimaní-Pedernales road, *Mickel et al. 8918* (NY).—SAN JUAN: Piedra del Aguacate to Rio del Oro, *Howard & Howard 9332* (NY). **Jamaica.** PORTLAND: Along road between Section and Hardwar Gap, *Proctor 23415* (IJ); On ridge between Blue Mountains peak and Sugar Loaf, *Proctor 4327* (IJ).—ST. ANDREW: Marcos Gap, *Watt 4* (IJ).—WESTMORELAND: Near Vinegar Hills, *Harris 7446* (IJ). **El Salvador.** CHALATENANGO: E side of Los Esesmiles, *Tucker 1043* (US). **Colombia.** NORTE DE SANTANDER: Road from Pamplona to Toledo, crossing the divide between Río La Teja (Maracaibo drainage) and Río Mesme (Orinoco drainage), *Killip & Smith 19971* (GH). **Ecuador.** GALAPAGOS: Isabela. SW slope of Volcano Cerro Azul, *van der Werff 2258* (A). **Peru.** CUZCO: Prov. Convencion. Distrito Vilcabamba; Trail Yupanqui to Rio Apurimac, *Davis et al. 1229* (GH).—MADRE DE DIOS: Prov. Manu. Carbon-Salvación, *Vargas 16902* (GH).

2. ***Amauropelta pteroidea*** (Klotzsch) O. Alvarez — **Cuba.** GRANMA: La Bayamesa. Alrededores de Pico Botella, Barrio Nuevo, *Caluff 5824* (BSC); La Bayamesa. Orilla del camino entre El Manguito y Barrio Nuevo, *Caluff 5751* (BSC). **Haiti.** OUEST: Vicinity of Mission, Fonds Varettes, *Leonard 3924* (US).—SUD-EST: Osman, Morne la Selle, *Holdridge 2074* (US); Massif de la Selle, gr. Créte-a-Piquants, Port-au-Prince, top of Morne Malanga, *Ekman H5466* (US); Massif de la Selle, Morne d'Enfer, *Ekman H1720* (US); Near Savane, Morne des Commissaires, *Holdridge 2073* (MICH, US). **Dominican Republic.** AZUA: Sierra de Ocoa, San José de Ocoa, Bejucal, slope of Loma de los Palos Mojados, *Ekman H11839* (US).—BARAHONA: Sierra de Baoruco, 7.2 km from the Cabral-Palo road, on the road to Monteada Nueva, in areas called "El Gayo" and "Cortecito", *Mickel et al. 8014* (JBSD).—INDEPENDENCIA: Sierra de Baoruco. 38 km S de Duvergé (o 5 km S de Aguacate) en la Carretera Internacional a Los Arroyos y Pedernales, 18°18' N, 71°42.5' O, *Zanoni & Pimentel 26543* (JBSD); Sierra de Neiba, along the Carretera Internacional near the crest of the range, along the Haitian border, *Gastony et al. 602* (US).—LA VEGA: Cordillera Central. Constanza, Pinar Parejo, a 1 km del cruce de Culo de Maco, camino a la caseta de foresta, *Veloz et al. 1284* (JBSD); Very moist ravine on trail between Los Tablones (ca. 2 mi W of La Ciénaga) and La Lagunita (Lagüita), *Gastony et al. 326* (US).—PERAVIA: Cordillera Central. Loma Los Palos Mojados, NNE de El Bejucal, en la cabecera del Río El Canal, 18°37.5' N, 70°35' O, *Zanoni et al. 22279* (JBSD). **Colombia.** ARAUCA: Sarare. Alto del Mirador, *Bischler 2124* (MICH).—SANTA MARTA: Unknown locality, *Smith 2580* (MICH).

3. ***Amauropelta muscicola*** (Proctor) O. Alvarez — **Nevis.** Nevis Peak, southern slope, *Smith 10520* (US).

Table 2 (cont'd)

4a. ***Amauropelta rudis*** (Kunze) Pic. Serm. var. ***rudis*** — **Cuba.** SANTIAGO DE CUBA: Along Río Peladero, below Aserradero San Antonio de las Cumbres, crest of Sierra Maestra, *Morton 9511* (US). **Haiti.** OUEST: Vicinity of Furcy, Morne de Weyan, *Leonard 4626, 4662* (US); Vicinity of Mission, Fonds Varettes, *Leonard 3868* (US).—SUD: Massif de la Hotte, La Hotte National Park, Morne Cavalier, *Judd 4032* (GH).—SUD-EST: Massif de la Selle, Petionville, Morne Bronel, *Ekman H1125* (US); Massif de la Selle, Ravine of Riviere Blanche, near where crossed by road from Seguin to Furcy; La Visite National Park, *Judd 4314* (GH); Morne La Selle, 15.8 km oeste del aserradero viejo de Mare Rouge en el camino a Seguin, *Zanoni et al. 18651* (NY). **Dominican Republic.** LA ESTRELLITA: Near crest of Sierra de Neiba, along road between Angel Felix and Hondo Valle, just N of Prov. Independencia boundary, *Proctor 39251* (JBSD, NY).—LA VEGA: Cordillera Central, 5.0-5.4 km W of La Culata de Constanza, area called Agua Fría, on road between La Culata to (Ciénaga de) Bermudez (= Ciénaga de la Culata), *Mickel et al. 8404, 8416* (NY); Cordillera Central. Reserva Científica Ebano Verde; en el valle del Arroyo Arroyazo, 19°02' N, 70°32' O, *Zanoni et al. 46374* (JBSD).—PEDERNALES: Sierra de Baoruco, 7.2-7.7 km S of ridge top, 4.8-5.3 km N of Los Arroyos on Jimaní-Pedernales road, *Mickel et al. 8922* (NY).—PERAVIA: Los Cateyes, falda NE de la Loma Valvacoa, al NO de Baní, 18°29' N, 70°23' O, *Mejia & Pimentel 18339* (NY). **Jamaica.** Unknown locality, 1885, *J.P. s.n.* (US).—PORTLAND: Along road northeast of Hardwar Gap, near Green Hills, *Proctor 22254, 22257* (IJ); On the side of the road B1 heading N from Mewcastle, 18°05.57' N, 76°43.138' W, *Alvarez-Fuentes et al. 504* (IJ, MSC); Road from Silver Gap to Hardwar Gap, *Maxon & Killip 1266* (NY, US).—ST. ANDREW: Bellevue (old name for Cinchona), *Hart 1232* (IJ); South side of Hardwar Gap, *Proctor 20823* (IJ).—ST. ANN: Fern Gully, 1895, *Gilbert s.n.* (GH). **Puerto Rico.** ADJUNTAS: Monte Guillarte: summit area, *Proctor & Estremera 39945* (US).—FLORIDA: On slope in forest, near Florida, *Liogier et al. 33121* (NY).—JAYUYA: Along roadside in disturbed area, 2 Jan 1978, *Tullis s.n.* (GH); Cerro de Punta - Cerro Maravilla, *Sánchez & Liogier 211, 214* (NY); Jayuya, in forest, *Sargent 3147* (US); Monte Jayuya, Rte. 143, km 18, *Hickey 543* (GH); On roadside, Cerro Maravilla area, *Liogier et al. 33922, 33941, 33953* (NY).—OROCOVIS: Toro Negro State Forest. Summit of Cerro Doña Juana, *Proctor et al. 40626* (US); Toro Negro State Forest. E side of Cerro de Punta, *Proctor 40751* (US); Toro Negro State Forest. W slopes of Cerro Doña Juana, *Proctor et al. 40602* (US).—PONCE: Toro Negro Forest Reserve, headwaters of Inabon River due S of Rd. 143, km 18.8-18.9, 18°09'43" N, 66°34'32" W, *Acevedo-Rodriguez & Breckon 7824* (US). **Mexico.** DURANGO: 114 m W of Cd. Durango, on Durango-Mazatlan Rd., *Knobloch 2138* (GH,MSC).—HIDALGO: Acaxochitlan, *Knobloch 684* (GH,MSC).—JALISCO: La Venta, Zapopan, *Garcia 2, 14* (MSC).—MORELOS: Wet mountain canyon above Cuernavaca, *Pringle 13773* (MSC).—PUEBLA: By brooks in pine forest near Honey Station, *Pringle 8920* (MSC). **Guatemala.** TOTONICAPÁN: Ravine in cypress forest near Polagua, Sierra Madre Mountains, 20-25 km N of Cristóbal, *Williams et al. 22660* (US). **Honduras.** MORAZÁN: Montaña Uyuca, entre Labranza y Granadillo, *Molina 13581* (GH); Mt. Uyuca, drainage of the Río Yeguare, at about Longitude 87° W and Latitude 14° N, *Williams 15807* (GH). **Costa Rica.** CARTAGO: Slopes of Volcan Irazu, Rt. 8, km 29.2, 0.8 km below park entrance, *Hill et al. 17820* (MSC).—HEREDIA: Slope of Volcan Barba, *Scamman & Holdridge 7967* (GH). **Panama.** CHIRIQUÍ: Humid forests of the upper Caldera watershed, between "Camp I" and the Divide Holcomb's trail, above El Boquete, *Maxon 5675* (GH). **Colombia.** ANTIOQUIA: Piedras Blancas, *Cabrera 273* (MSC).—CAUCA: 8 km E of Popayan on road to Puracé, *Tryon & Tryon 5956* (GH). **Venezuela:** MERIDA: San Euselia, 22 km W of Mérida on road to La Azulita, *Tryon & Tryon 5768* (GH).—TRUJILLO: Selva nublada, alrededores de un pantano grande entre Boconó y El Batatal, *Steyermark & Rabe 97366* (GH).

Table 2 (cont'd)

A. rudis var. *rudis* cont'd
Ecuador. COTOPAXI: Around Pilalo, 79°2' W, 0°57' S, *Holm-Nielsen & Jeppesen 1180* (GH).–-PICHINCHA: Above Chaupi-Sagcha, Pululagua, *Bell 519* (GH). **Peru.** AMAZONAS: Prov. Pongara, Dist. Yambrasbamba, ca. km 58, *Tillett 297* (GH).—PASCO: Prov. Oxapampa: Dist. de Oxapampa: Río San Alberto, camino arriba estación hidroeléctrica, *Leon 632* (GH).

5. *Amauropelta rupestris* (Klotzsch) O. Alvarez — **Haiti.** OUEST: Vicinity of Mission, Fonds Verrettes, *Leonard 4001* (GH, NY, US).—SUD-EST: Franchon, M. des Comm. [Morne des Commissaires], *Holdridge 1984* (GH, MICH, NY, US); (all from Massif de la Selle), Marigot, Gd. Bassin Chotard, *Ekman H 10067* (US); ca. 3 km E of Seguin on road to Mare Rouge, *Mickel et al. 9360, 9363* (NY); Mare Blanche, 12.7 km E of Seguin on road to Mare Rouge, *Mickel et al. 9391* (NY). **Dominican Republic.** BARAHONA: Sierra de Baoruco, 7.2 km from the Cabral-Palo road, on the road to Monteada Nueva, in area called "El Gayo" and "Cortecito", *Mickel et al. 8073* (NY); Sierra de Baoruco (extremo oriental), mas arriba de la Finca Habib, Loma Pie de Pol (Pie Pol), al final de la carretera de La Guasara (de Barahona), *Zanoni et al. 41142* (JBSD).—PEDERNALES: Sierra de Baoruco, 7.2-7.7 km S of ridge top 4.8-5.3 km N of Los Arroyos on Jimaní-Pedernales road, *Mickel et al. 8919* (NY). **Jamaica.** PORTLAND: 1/2 miles north of Hardwar Gap, near the waterfall, *Proctor 10174* (IJ); Hardwar Gap: along trail toward the waterfall, *Proctor 4421* (IJ).—ST. ANDREW: Fox's Gap, *Proctor 5483* (IJ).—ST. MARY: Along trail N of Fox's Gap, *Proctor 35580* (IJ); Along trail, 2 to 5 miles S of Longroad P.O., *Proctor 5449* (IJ). **Colombia.** MAGDALENA: Santa Marta, *Smith 997* (GH).

6. *Amauropelta linkiana* (C. Presl) O. Alvarez — **Cuba.** GRANMA: Buey Arriba a Pino del Agua Arriba, *Caluff 2324* (BSC). **Dominican Republic.** LA VEGA: Cordillera Central, El Salto de Casabito, 7 km W of Carretera Duarte on the road to Constanza, *Mickel 8557* (JBSD); Cordillera Central, Reserva Científica Ebano Verde; en el Valle del Arroyo Arroyazo, *Zanoni 46358* (JBSD).—MONTE CRISTI: Cordillera Central: Manción at the junction of Río Cenobí and Río Cenobicito, *Ekman H 12935* (US).—SAN CRISTOBAL-PERAVIA: Cordillera Central, along Río Mahoma, 5.3 km E of Piedra Blanca-Rancho Arriba road (from point 19 km SW of Piedra Blanca, 11.2 km NE of Rancho Arriba, 0.7 km NE of La Penita), *Mickel 9088* (NY). **Jamaica.** ST. THOMAS: Cuna Cuna Pass, 1895, *Gilbert s.n.* (GH). **Guadeloupe.** BASSE TERRE: Along trail between Plateau de Papaye & Ravine Chaude, above Matouba, *Proctor 20148* (A, US); Bains Chauds du Matouba, *Stehlé 1453* (US); Bains Jaunes, *Stehlé 2430* (US); Matouba, bord de la riviere Rouge. Camp Jacob, *Pére Duss 4170* (US); Ravine Rocks of St. Claude, *Questel 2876* (US); Sources sulfurenses du Cralion afrés les Bains Jaunes, *Stehlé 2433* (US); Matouba, *Mouré s.n.* (NY). **Martinique.** Unknown locality, 1899, *Pére Duss s.n.* (US). **Mexico.** OAXACA: At km 84 on Hwy 175, ca. 50 air km S of Tuxtepec, *Conrad & Conrad 3239* (NY); District of Villa Alta, valley of the Yelagago River, ca. 20 mi NE of Villa Alta. Along streams at Hallberg ranch. 17°25' N, 96°05' W, *Mickel 1017* (MSC, NY); Distrito Cuicatlán. Vicinity of Teutila, *Mickel 7314* (NY); Distrito Ixtlán. 2-3 km S of Vista Hermosa, 75-76 km N of Ixtlán de Juárez on Rte 175, *Mickel & Pardue 6545* (NY); Dto. Ixtlán. 29 km S of Valle Nacional, 80 km N of Ixtlán de Juárez, trail E of Rte 175 at Campamento Vista Hermosa toward Ladú, 1 hour hike down to Río de la Trucha, *Mickel 6387*, *Mickel 6397* (NY); Dto. Tuxtepec. 4-9 km S of Valle Nacional on Rte 175, *Mickel 5901* (NY); Road from Ixtlán to Tuxtepec, 24 km S of Valle Nacional (km 85), *Mickel 1440* (NY).—VERACRUZ: Along stream in Teocello Canyon, below bridge and before Teocello, *Knobloch 2192* (MSC, US); Mun. Xalapa; El Cerro de Macuiltepetl, *Zola 690* (NY); Municipio de Teocelo; Teocelo, *Ventura 7324* (NY); Near

Table 2 (cont'd)

A. linkiana cont'd

Córdoba, *Spencer 69 pt* (GH). **Belize.** TOLEDO: Southern Maya Mountains, Bladen Nature Reserve, West Snake Creek. Along Snake Creek through tall evergreen forest. 16°27'54" N, 89°01'04" W, *Holland 29* (NY). **Guatemala.** Finca Samimtacá, near Cobrán, *Hatch & Wilson 261* (US).–ALTA VERAPAZ: Quebrada Seca, *Johnson 853* (US).—SUCHITEPÉQUEZ: S-facing slopes and barrancos of Volcán Santa Clara, 1.5-2 miles W of Finca El Naranjo, *Steyermark 46814* (GH). **Costa Rica.** SAN JOSÉ: Vicinity of El General. *Skutch 2330* (GH). **Colombia.** MAGDALENA: Alto Río Buritaca, Alto de Mira; por el camino a la Quebrada Julepia. 11°05' N, 73°48' W, *Madriñán & Barbosa 218* (GH); Alto Río Buritaca, Finca El Paraíso; filo Micay; camino Alto de Mira-El Paraíso. 11°05' N, 73°48' O, *Madriñán 445* (GH); Región del Campano, Sierra Nevada de Santa Marta, *Barkley & Gutiérrez 1877* (GH). **Venezuela.** SUCRE: Península de Paria: Cerro de Río Arriba: laderas de bosque siempreverde oeste de Cerro de Humo, a lo largo del Río Santa Isabel, arriba de Santa Isabel, *Steyermark 96238* (GH). **Brazil.** BRASILIA: Rio Grande do Sul, Porto Alegre, *Lindman A 379* (GH).—MINAS GERAES: Vicosa. Fazenda de Aguada. About 1.5 km from gate, *Mexia 5370* (GH). **Ecuador.** GALÁPAGOS: Santa Cruz, near Media Luna, *van der Werff 1691* (A). **Peru.** CUZCO: Paucartambo. Kosñipata: Pilcopata-Sta. Inés, *Vargas 11314* (GH).—HUANUCO: Distrito Churubamba; Hacienda Mercedes, Poca Perga, *Mexia 8188 a* (GH); Tingo María, *Tryon & Tryon 5235* (GH).—SAN MARTÍN: Tingo María, *Allard 22289* (GH). **Bolivia.** Ipurima, *Williams 1249* (GH).—ANTAHUACANA: Tal des Espíritu Santo Flusses etwa 160 klm. Nordöstlich von Cochabamba, *Buchtien 6* (GH).

7. ***Amauropelta consimilis*** (Maxon) O. Alvarez — **Guadeloupe.** Unknown locality, *L'Herminier s.n.* (GH); [Drinba], *Questel 1152* (US); Bernard, *Questel 3043* (US); Morne [Drinba], *Questel 2960* (US); Ravine Malanga, *Stehlé 1443* (GH, US); Trois riviéres, *Stehlé 1857* (GH, US).—BASSE TERRE: Along Trace Victor Hugues between Grande Découverte and Savane aux Ananas, *Proctor 20328* (A, US); Moscou district, S of La Citerne, *Proctor 20131* (A, US); Bois supérieurs du Gommiér, Matelyane [et]t riviére ronge (Matouba), *Pére Duss 4066* (US); Flammarion (Grande Citerne), *Stehlé 2434* (US); Matouba, chemin du Matelyane, coulée de la G[de] Dacouverte, Camp-Jacob. Lamentin (Ravine Chaude), *Pére Duss 4036* (GH, NY, US); Sac Flammarion (Trace), *Stehlé 2427* (US). **Dominica.** Rainforest borders between Laudat and Freshwater Lake, *Hodge & Hodge 1764* (GH, US).—ST. GEORGE: On clay bank alongside Fresh Water Lake. *Lellinger 459* (US).—ST. PAUL: On rocks along trail from behind the Pont Cassé Police Post part of the way up Morne Trois Pitons. *Lellinger 546* (US). **Martinique.** Montagne Peléc, Morne Paillasse, Morne Jacob, *Pére Duss 4156* (NY, US). **St. Vincent.** Unknown locality, *Smith & Smith 1130* (NY, US).

8. ***Amauropelta gracilis*** (Heward) O. Alvarez — **Cuba.** SANTIAGO DE CUBA: Loma del Gato, Sierra Maestra, *Clement 941*, *971*, *1271*, *1301*, *1304* (US); *Clement 972* (A, GH, MICH, US); *Hioram & Clement 6452* (GH, US); *Hioram & Clement 6447*, *6453* (US); Firmeza to Gran Piedra, *Shafer 8952* (A, US); El Olimpo, Gran Piedra, cañadas debajo del albergue forestal, *Caluff 4670* (BSC). **Jamaica.** Unknown locality, 1874, *Jenman s.n.* (US); Unknown locality, 1850, *Alexander s.n.* (US); Unknown locality, 1895, *Gilbert s.n.* (MICH).—PORTLAND: On the side of the road B1 heading N from Newcastle. 18° 5.134' N, 76° 43.386' W, *Alvarez-Fuentes et al. 506, 508* (IJ, MSC); E slope of the John Crow Mountains, ca. 1.5 miles W of Ecclesdown, *Alvarez-Fuentes et al. 536, 537* (IJ, MSC); Above Cedar Valley, along the parochial road to

Table 2 (cont'd)

A. gracilis cont'd
Silver Hill Gap, *Maxon 10317* (GH, US); Foothills of the John Crow Mountains, E of Seamen's Valley, *Maxon & Killip 220* (GH, US); Spur of John Crow Mountains opposite Mill Bank, *Maxon 9343* (US); Port Antonio, 1895, *Roper s.n.* (GH).—ST. ANDREW: West Minister, along a trail passing Fox's Gap. 18° 9.868'N, 76° 45.213'W, *Alvarez-Fuentes et al. 523, 525, 528* (IJ, MSC); Mount James and vicinity, *Maxon 8527* (US); *Maxon 8565* (US); *Maxon 8524* (US); Flamstead and vicinity, Port Royal Mountains, *Maxon 8651* (US); Hermitage Dam and vicinity, *Maxon 8815* (US); Second Breakfast Spring, near Tweedside, *Maxon 989* (US).—ST. ANN: Douglas Castle district, near sink of the Blue River, *Proctor 23377* (MICH).—ST. THOMAS: Along the trail from Portland Gap to the Blue Mountains Peak, *Alvarez-Fuentes et al. 541, 547, 548, 553, 559, 562, 563* (IJ, MSC); Deep ravine in mountain forest above House Hill, *Maxon 8849* (GH, US); Deep ravine in mountain forest above House Hill, *Maxon 9069* (US); Hayfield, St. Thomas in the East [Chappel in Bath], 22 Apr 1891, *Day s.n.* (NY); Cuna Cuna Gap, *Hatch 42* (US); Along the trail from Bath to Cuna Cuna Pass, *Maxon 1723* (US); Mansfield, near Bath, *Maxon 1788, 1796* (US); Mansfield and adjoining properties, near Bath, *Maxon 2370* (US).—TRELAWNY: Cockpit country, along track between Windsor and Tyre, N of Troy, *Proctor 15751* (MSC).—WESTMORELAND: Venegar Hill, *Watt 143* (US).

9. *Amauropelta heteroclita* (Desvaux) Pic. Serm. — **Haiti.** Massif de la Selle, group Crete-a-Piquants, Port-au-Prince, Morne Malanga, *Ekman H5443* (US). **Dominican Republic.** BARAHONA: Eastern edge of Sierra de Baoruco, 22.5 road km SW of Barahona, 9.4 km W of El Arroyo at Las Filipinas, *Mickel et al. 8976* (NY).—LA VEGA: Cordillera Central, El Salto de Casabito, 7 km W of Carretera Duarte on the road to Constanza, *Mickel et al. 8555* (NY). **Jamaica.** Unknown locality, Apr 1891, *Day s.n.* (NY); Unknown locality, *Jenman 212* (US); Unknown locality, 1874, *Jenman s.n.* (US); Unknown locality, 1900, *Clute s.n.* (GH).—PORTLAND: On the side of the road B1 heading N from Newcastle. 18° 5.134' N, 76° 43.386' W, *Alvarez-Fuentes et al. 501, 505* (IJ, MSC); E slope of the John Crow Mountains, ca. 2 1/2 miles SW of Ecclesdown, *Proctor 5740* (IJ); Blue Mountain peak: N slope of summit area, *Proctor 4309* (IJ); Along road NE of Hardwar Gap, *Proctor 22787* (IJ, MICH); Base of Blue Mountain Peak, *Maxon 1453* (US); *Underwood 2469* (NY); Blue Mountains, 12 Jul 1932, *Papenfuss s.n.* (US); Lower western ridge of Blue Mountain Peak, *Maxon 10022* (GH, US); Morses Gap, *Harris 7197* (NY); N of Hardwar Gap, *Yuncker 18515* (MICH, NY); Sir John's Peak trail, *Killip 255* (US); Summit of Blue Mountain Peak, *Maxon 9899* (US); Upper slopes of Blue Mountain Peak, *Maxon & Killip 1149* (GH, NY, US); Upper valley of Buff Bay River, about 1/2 mile (road) N of Green Hill (Newcastle to Buff Bay road), *Tryon et al. 6957* (GH).—ST. ANDREW: "Main Ridge Gap" and vicinity (W of Mossman's Peak), *Maxon 10238* (US); Belvedere, the Red Hills, May 1891, *Day s.n.* (NY); Catherines' peak, *Eggers 3799* (US); Cinchona, *Underwood 2336* (NY); *Maxon 1196* (US); Vicinity of Cinchona, *Maxon & Killip 1709* (GH); *Underwood 3115* (US); Hardwar Gap, *Fisher 53* (NY); Hardwar Gap, Apr 1926, *Davis s.n.* (MICH); Morce's Gap, Nov 1915, *Farr s.n.* (NY); Morse's Gap, Cinchona, *Faull 12632* (GH); New Haven Gap, Blue Mountain range, *Chrysler 1490* (MICH); *Underwood 2637* (NY); *Clute 205* (US); Radnor [plantation], Blue Mountains, May 1926, *Davis s.n.* (MICH); St. Helen's to Morce's Gap, Blue Mountain range, *Chrysler 4531* (MICH); Vicinity of St. Helens Gap, *Maxon & Killip 624* (GH, NY, US); On a hillside trail between Greenwich Dr and B1 Road. 18° 4.622' N, 76° 43.518' W, *Alvarez-Fuentes et al. 509* (IJ, MSC); West Minister, along a trail passing Fox's Gap. 18° 9.868' N, 76° 45.213' W, *Alvarez-Fuentes et al. 517, 529, 530* (IJ, MSC).—ST. CATHERINE: Hollymount on Mount Diablo, *Crosby et al. 602* (GH, MICH);

Table 2 (cont'd)

A. heteroclita cont'd
Upper slopes of Mount Diabolo, *Maxon & Killip 498* (GH, NY, US); Vicinity of Hollymount, Mount Diabolo, *Maxon 2321* (US); Juan de Bolas district, west of Point Hill, *Proctor 6962* (IJ).––ST. THOMAS: Along the trail from Portland Gap to the Blue Mountain Peak, *Alvarez-Fuentes et al. 542, 543, 544, 545, 546, 549, 550, 551, 552, 554, 555* (IJ, MSC); Near Portland Gap, 17 Apr 1948, *Bengry s.n.* (IJ); Between Blue Mountain Peak and Portland Gap, *Crosby et al. 899* (GH, MICH).

10a. *Amauropelta oligocarpa* (Humb. & Bonpl. ex Willd.) Pic. Serm. var. ***oligocarpa* — Cuba.** SANTIAGO DE CUBA: Along Río Buey, N slope of Sierra Maestra, *Morton & Acuña 3800* (US); Loma del Gato and vicinity, Grupo del Cobre, Sierra Maestra, *Clement 1774* (NY); Loma del Gato, *Hioram 7319* (US); Sierra Maestra, El Cobre, Loma del Gato, *Clement 1692* (US); Sierra Maestra, in the dwarf forest near La Gran Piedra, *Ekman 8801* (US); Sierra Maestra, La Gran Piedra, *Ekman 1610* (US); Upper slopes and summit of Gran Piedra, *Maxon 4041* (US); Gran Piedra. Centro turístico Gran Piedra, bajando por un camino que empieza en la cabaña 1 hasta llegar al nacimiento de una cañada en el bosque pasando los pinares. 20°00'31.6" N, 75°37'50.4" O, *Serguera 504, 505, 506, 508* (BSC, MSC); Gran Piedra. Centro turístico Gran Piedra, subida a la Piedra por las escaleras. 20°00'42.9" N, 75°37'45.4" O, *Serguera 511* (BSC, MSC). **Haiti.** Massif des Cahos, Las Caobas, Chapelle Ste. Claire, *Ekman H5545* (US); Unknown locality, *Jaeger 168* (US).—OUEST: Morne Etablie, 2 miles W of Morne des Commissaires, *Proctor 10887* (US); Near Oriani road, Mornes des Commissaires, *Holdridge 909* (MICH, US); Vicinity of Furcy, *Leonard 4335, 4414* (US); Vicinity of Furcy, Morne de Weyan, *Leonard 4606, 4609* (US).—SUD: Massif de la Hotte, western group, Les Roseaux, Morne Gillet, *Ekman H10172* (US).—SUD-EST: Massif de la Selle, Croix-des-Bouquets, Badeau, *Ekman H7639* (US); Massif de la Selle, Marigot, Jardins Bois-Pin, *Ekman H10063* (GH); Massif de la Selle, Marigot, Macary, *Ekman H5981* (US); Massif de la Selle, Petionville, top of Morne Tranchant, *Ekman H10007* (US); Massif de La Selle: Cerca de "Grand Ravine", 3 km Oeste de Seguin en el camino hacia Mare Rouge, 18°19' N, 72°13' O, *Zanoni & Mejia 24587* (JBSD). **Dominican Republic.** AZUA: Cordillera Central, San Juan, Loma La Vieja, at Arroyo de la Vieja, *Ekman H13415* (NY); Sierra de Ocoa, San Jose de Ocoa, at Bejucal, *Ekman H11773* (US); Sierra de Ocoa, San Jose de Ocoa, Loma del Rancho, *Ekman H11626* (US).—BARAHONA: Sierra de Baoruco: En la cima de Morne La Jo, 18°18' N, 71°17' O, *Zanoni & Garcia 30392* (US).—ELIAS PIÑA: Cordillera Central, 14 km S of Loma de Cabrera on road to Restauracion and 22 km E to Río Limpio (end of road). Arroyo "El Valle" just past pueblo of Río Limpio, *Mickel et al. 8658* (NY); Municipio Hondo Valle, Sierra de Neiba. En la pared de la roca al lado del camino en la subida hacia el puesto militar 204 ascendiendo desde Aniceto Martínez. 18°42'19.4" N, 71°46'03.5" O, *Alvarez-Fuentes & Clase 652* (JBSD, MSC); En la subida hacia el puesto militar 204 ascendiendo desde Aniceto Martínez. 18°41'35.4" N, 71°45'46.0" O, *Alvarez-Fuentes & Clase 653, 655, 656, 657* (JBSD, MSC); Descendiendo hacia Aniceto Martínez, a 200 metros del puesto militar 204, en la primera curva grande del camino. 18°41'31.7" N, 71°46'53.0" O, *Alvarez-Fuentes & Clase 659* (JBSD, MSC); Descendiendo hacia Aniceto Martínez desde el puesto militar 204, a orilla del camino. 18°41'40.1" N, 71°46'05.8" O, *Alvarez-Fuentes & Clase 667, 668* (JBSD, MSC); En la subida hacia el puesto militar 204 ascendiendo desde Aniceto Martínez. 18°41'35.4" N, 71°45'46.0" O, *Alvarez-Fuentes & Clase 669, 670, 671, 672, 675, 677, 680, 681, 684* (JBSD, MSC).—INDEPENDENCIA: Sierra de Baoruco: 30.5 km al "sur" de Puerto Escondido en el camino a Aceitillar (o 3.9 km al "sur" de la Caseta No. 2 de Foresta), 18°14' N, 71°30' O, *Zanoni et al. 33757* (JBSD); Municipio Neiba,

Table 2 (cont'd)

A. oligocarpa var. ***oligocarpa*** cont'd

Sierra de Neiba. A la orilla del camino, 300 metros antes de llegar a la pirámide de la 204 ascendiendo desde Angel Félix. 18°41'23.4" N, 71°47'13.5" O, *Alvarez-Fuentes & Clase 686* (JBSD, MSC); A la orilla del camino, 1.5 km después de la pirámide de la 204 descendiendo desde el puesto militar 204 hacia Angel Félix. 18°40'43.6" N, 71°47'08.2" O, *Alvarez-Fuentes & Clase 687* (JBSD, MSC); A la orilla del camino, descendiendo desde el puesto militar 204 hacia Angel Félix, *Alvarez-Fuentes & Clase 689, 690, 691, 692, 693* (JBSD, MSC); "Entrada de los mulos"; entrada al bosque por el camino, a 2.7 km descendiendo desde la pirámide 204 hacia Angel Félix. 18°40'30.0" N, 71°46'07.3" O, *Alvarez-Fuentes & Clase 694* (JBSD, MSC); Carretera Internacional en borde con Haití. A la orilla del camino, descendiendo desde la pirámide de la 204. 18°39'51.5" N, 71°46'39.2" O, *Alvarez-Fuentes & Clase 701* (JBSD, MSC).–-LA VEGA: 2 km W from La Culata de Constanza on road to Parque Nacional Bermúdez, 18°58' N, 70°47' W, *Mejía & Zanoni 12305* (A); 2 km W from La Culata de Constanza on road to Parque Nacional Bermúdez, 18°58' N, 70°47' W, *Zanoni & Mejia 12305* (NY); Cordillera Central, Constanza, at Río del Medio, *Ekman H14013* (US); Cordillera Central, El Convento, *Smith 10274* (JBSD); Cordillera Central: Parque Nacional J. A. Bermúdez; en el valle del Río Los Tablones, al interior del parque caminando desde Los Tablones, 19°03' N, 70°54' O, *Zanoni et al. 39249* (JBSD).—PEDERNALES: Sierra de Bahoruco: 3 km antes de la caseta no. 2, 18°12'15.2" N, 71°33.8'06" O, *Clase et al. 4268* (JBSD).—PERAVIA: Cordillera Central: Loma Los Palos Mojados, NNO de El Bejucal, en la cabecera del Río El Canal, 18°37.5' N, 70°35' O, *Zanoni et al. 22313* (JBSD).—SAN JUAN DE LA MAGUANA: Distrito Municipal Sabaneta, Sabana Vieja; nacimiento del rio San Juan, 19°04'53.1" N, 71°11'8.16" O, *Clase et al. 4829* (JBSD); Sierra de Neiba: Municipio El Cercado, paraje Pinar Grande, Sabana del Silencio, en Loma de los Magueyes, *Clase et al. 2413* (JBSD). **Jamaica.** Abbey Green and vicinity, *Maxon 10056* (GH, NY, US); Unknown locality, 1895, *Gilbert s.n.* (GH); Unknown locality, *J.P. 369* (US).—HANOVER: Green River, 1903, *Shreve s.n.* (MICH).—PORTLAND: Along road NE of Hardwar Gap, near Green Hills, *Proctor 22255* (A, IJ); Blue Mountain Peak, 17 Feb 1935, *Faull s.n.* (GH); Lower western ridge of Blue Mountain Peak, *Maxon 10025* (US).—ST. ANDREW: Moody's Gap, *Alvarez-Fuentes et al. 531, 532, 533* (IJ, MSC); Cinchona, *Killip 261* (US); St. Catherine's Peak, 1896, *Moore s.n.* (GH); Vicinity of Cinchona, *Underwood 3116* (NY, US); Vicinity of Cinchona, *Maxon & Killip 1709* (US). **Mexico.** JALISCO: Sierra de Manantlán (15-20 miles SE of Autlán), on the bajada S and W of the divide between Aserradero San Miguel Uno and Durazno, *McVaugh 14011* (US); Slope of a barranca near Atequizallán, lower slopes of Volcán Nevada, *Correll 14365* (GH).—PUEBLA: Temimil, Mpio. Chignautla, *Ventura 22373* (US).—VERACRUZ: Environs of Xalapa, road from Xalapa to Misantl, ca. 10 km N of Xalapa, Pedregal Esquilon, *Sperling 4976* (GH); Jalapa, *Arsene 1755* (US); Metlac, *Copeland 22* (US); Orizaba, Río Blanco, *Bourgeau 1362 bis* (US). **Guatemala.** EL QUICHE: N of Nebaj, *Proctor 25001* (US).—SANTA ROSA: Near El Molino, *Standley 78373* (US).—TOTONICAPÁN: Sierra Madre Mountains about 10-15 km S of Totonicapán, *Williams et al. 41490* (GH). **Honduras.** Unknown locality, *Ray 2150* (GH). **Costa Rica.** SAN JOSE: Vicinity of Tarbaca (1 km S and 2 km N), *Mickel 2404* (US). **Panama.** CHIRIQUÍ: Vicinity of El Boquete, *Maxon 4936* (GH). **Brazil.** SAO PAULO: Ypiranga, *Luederwaldt s.n.*, Jun 1910, (GH). **Ecuador.** GALÁPAGOS: Isabela, E rim of Vulcan Alcedo, *van der Werff 1203* (A). **Peru.** CUSCO: Prov. Urubamba: Distr. Machu Picchu; just before Machu Picchu station, right side, *Saunders 1231* (GH). **Argentina.** TUCUMÁN: Dept. Burruyacu; cerro El Nogalito, *Venturi 8877* (GH); Dept. Tafí, boca de la quebrada de Caspinchango, *Lihreiter 4367* (GH).

Table 2 (cont'd)

10b. ***Amauropelta oligocarpa*** var. ***navarrensis*** (H.Christ) O. Alvarez — **Cuba.** GRANMA: Vertiente río Nuevo Mundo, El Zapato, La Bayamesa, *Shelton 5838* (BSC).—SANTIAGO DE CUBA: Camino a la Gran Piedra, *Clement 6528* (US). **Haiti.** SUD: Massif de la Hotte, eastern group, Pt. Goave at Bellevue, *Ekman H6609* (GH, MICH, NY, US). **Dominican Republic.** BARAHONA: Sierra de Baoruco, 7.2 km from the Cabral-Palo road, on the road to Monteada Nueva, in areas called "El Gayo" and "Cortecito", *Mickel et al. 8049* (NY); Sierra de Baoruco, 7.2 km from the Cabral-Palo road, on the road to Monteada Nueva, in areas called "El Gayo" and "Cortecito", *Mickel et al. 8051* (NY); Sierra de Baoruco, 7.2 km from the Cabral-Palo road, on the road to Monteada Nueva, in areas called "El Gayo" and "Cortecito", *Mickel et al. 8060* (NY); Sierra de Baoruco. 4 km arriba del pueblecito rural de "Entrada de Cortico" en el camino a El Gajo, 18°07.5' N, 71°13.5' O, *Zanoni et al. 18920* (JBSD).—SANTIAGO: Cordillera Central: Sendero de Los Tablones (Poblado de la Ciénaga Prov. Santiago) a Pico Duarte (Límite Provs. Santiago-San Juan), *Sánchez & Caminero 72* (JBSD). **Jamaica.** Unknown locality, *Hart 304* (US).—PORTLAND: Northern side of Blue Mountains, Hardwar Gap and vicinity (Newcastle to Buff Bay road), ca. 3/4 mile (air) S of Green Hill, *Tryon & Tryon 6972* (GH).—ST. ANDREW: Near Trafalgar Gap, Port Royal Mountains, *Maxon 8737* (NY, US).—ST. THOMAS: Abbey Green and vicinity, *Maxon 10075* (US); Abbey Green and vicinity, *Maxon 10086* (GH, NY, US). **Puerto Rico.** ADJUNTAS: Monte Guilarte, summit area, *Proctor & Estremera 39946* (US).—JAYUYA: Cordillera Central: Barrio Veguitas. Valley of Río Veguitas just ENE of Cerro de Punta, *Proctor & Haneke 40391* (US); Barrio Saliente, Road 144, km 13, *Proctor & Pinto 40561* (US); Cerro de Punta-Cerro Maravilla, *Sánchez & Liogier 167, 168* (NY); Toro Negro Recreation Area. Disturbed trailside, trail to top of Toro Negro. Near picnic site, 4 Jan 1978, *Tullis s.n.* (GH).—MARICAO: Barrio Maricao Afuera. Along Road 105/120 just W of Village of Maricao, Oct. 1983, *Estremera s.n.* (US); Barrio Maricao Afuera. Along Road 105/120 just W of Village of Maricao, *Proctor 39652* (NY, US).—UTUADO: Barrio Tetuán, upper NE slopes & summit of Cerro Morales, *Proctor 41341* (US). **Costa Rica.** HEREDIA: W slope of Volcán Barba, above San Jose de Montana, *Proctor 27484* (GH).—SAN JOSÉ: Las Nubes, *Chisaki & Carter 1000* (US); NE of Coronado, NE of San José, *Chrysler & Roever 5340* (MICH); Vicinity of Tarbaca (1 km S and 2 km N), *Mickel 2403* (US). **Colombia.** ANTIOQUIA: Cordillera Central. Cerca de Porcesito en el valle del Río Medellín, *Hodge 6803* (GH).—CUNDINAMARCA: Cordillera Central. At railroad station Tablanca, 40 km WNW of Bogotá. *Little & Little 9161* (GH). **Peru.** AYACUCHO: Prov. La Mar, eastern Massif of the Cordillera Central opposing the Cordillera Vilcabamba between Tambo San Miguel, Ayna and Hacienda Luisiana, c. 12°43' S; 73°50' W, *Dudley 11885* (GH).

12. ***Amauropelta negligens*** (Jenman) O. Alvarez — **Jamaica.** PORTLAND: Trail from road to Woodcutter's Gap. Cloud forest on northern side of Blue Mountains, Hardwar Gap and vicinity (Newcastle to Buff Bay road), ca. 3/4 mile (air) S of Green Hill, *Gastony 73* (GH).

13. ***Amauropelta germaniana*** (Fée) O. Alvarez — **Cuba.** Loma de San Juan, *Clement 941* (US).—GRANMA: Sierra Maestra, on the divide between Río Yara and Río Palmamocha, *Ekman 14354* (US); Along Río Peladero, below Aserradero San Antonio de las Cumbres, crest of Sierra Maestra, *Morton 9521* (US).—SANTIAGO DE CUBA: Monte de la Gran Piedra, *Clement 6675* (US); Sierra Maestra, parte Este. Camino de Olimpo a la Gran Piedra, *Clement 6455* (US); Loma del Gato et environs, Sierra Maestra, El Cobre, *Clement 1758* (US); Loma del Gato, Cobre, *Clement 744* (US); Camino a la Gran Piedra, *Clement 6533* (US); Small stream near Palma Mocha, *Leon 11172* (US); Upper slopes and summit of Gran Piedra, *Maxon 4059* (US); Crest of

Table 2 (cont'd)

A. germaniana cont'd
Sierra Maestra between Pico Turquino and La Bayamesa, *Morton & Acuña 3774* (US); Gran Piedra. Centro turístico Gran Piedra, bajando por un camino que empieza en la cabaña 1 hasta llegar al nacimiento de una cañada en el bosque pasando los pinares. 20°00'31.6" N, 75°37'50.4" O, *Serguera 507, 509* (BSC, MSC). **Haiti.** OUEST: Massif des Cahos, group Las Caobas, Morne Dos-Bois-Rouge, *Ekman H5559* (US); Vicinity of Furcy, Morne de Weyan, *Leonard 4739* (US).—SUD: Massif de la Hotte, western group, Les Roseaux, Morne Gillet, near Sablier, *Ekman H10183* (US). **Dominican Republic.** LA VEGA: Cordillera Central, El Salto de Casabito, 7 km W of Carretera Duarte on the road to Constanza, *Mickel et al. 8557* (NY); Cordillera Central: Municipio de Constanza, en el camino que conduce de Catarey a Bonao, en la rivera de cañada honda, 18°58'30" N, 70°32'27" O, *Veloz et al. 3651, 3669* (JBSD).—MONTE CRISTI: Distr. of Sabaneta, Las Cidras, *Valeur 562* (MICH); Distr. Of Sabaneta, Las Cidras, *Valeur 561* (US). **Jamaica.** ST. ANDREW: Moody's Gap, *J.P. 175* (IJ). **Puerto Rico.** Barranquitas, *Hioram 270* (US).—ADJUNTAS: Alto de la Bandera, near Adjuntas, *Britton & Shafer 2059* (NY, US); Cordillera Central: just E of summit, Monte Guilarte, *Proctor 39350* (US).—JAYUYA: Cordillera Central: vicinity of Monte Jayuya. N side of Road 143, km 18.7, *Proctor 39440* (US).—MARICAO: Barrio Maricao Afuera: Road 105/120 just W of Maricao town, *Proctor 39827* (US).—PONCE: Toro Negro, 5 Mar 1936, *Quick s.n.* (MICH); Reserva Federal de Toro Negro, along road 143 near Km 3 Hm 2, *Stimson 1458* (GH, MSC).—RIO GRANDE: Sierra de Luquillo: Caribbean National Forest. Road 191, km 12.3, *Proctor 39372* (US); Sierra de Luquillo, El Yunque, *Sánchez & Liogier 74, 76, 78, 79, 83, 86* (NY); El Yunque, *Sargent 309* (US); Slopes of El Yunque, Caribbean National Forest, *Scamman 6531* (GH); Sierra de Luquillo, in Monte Jimenez, *Sintenis 1793* (US); Base of El Yunque Mt., *Blomquist 11941* (US); El Yunque, *Fosberg 44178* (US).—UTUADO: Utuado, *Sintenis 6449* (MSC); Utuado, *Sintenis 6455* (GH, NY, US).—YAUCO: Barrio Sierra Alta: summit area of Pico Rodadero, *Proctor & Díaz 44746* (US). **Montserrat.** Summit of area of Chance's Mountain, Soufriere Hills, *Proctor 19124* (A). **Guadeloupe.** Unknown locality, *Pére Duss 4051* (GH); Pointe Noire, *Pére Duss 4047* (US); Pointe Noire, *Pére Duss 4067* (GH, NY, US).—BASSE TERRE: Moscou district, S of La Citerne, *Proctor 20039* (A, US). **Dominica.** Unknown locality, *Bailey 776* (US); Road to Laudat, ca. 5 mi E Roseau, *Burch 1350* (GH); Sylvania Estate: Stream-cut, wooded gorge lying between the estate house and orange plantations, *Hodge 121* (GH, NY, US); Laudat, *Lloyd 173* (NY); Vicinity of Fresh Water Lake, near Laudat, *Smith 10265* (US); Lower slopes of Morne Plat Pays above Bellevue along trail to Grand Bay, *Wilbur et al. 7878* (US).—ST. DAVID: Open areas along Boeri Lake trail near Fresh Water Lake road. *Lellinger 576* (US).—ST. JOHN: On ground in rainforest along trail up Morne Diablotins from Syndicate Estate. *Lellinger 601* (US).—ST. PAUL: On banks in ravine of the Springfield River, S of Pont Cassé. *Lellinger 440* (GH, US); Clay bank above stream E of the Sylvania Estate house. *Lellinger 425* (MICH, US). **Martinique.** Ravines du Parnasse, Case Pilote, *Pére Duss 1560* (NY, US).—MORNE CALEBASSE: N of Morne Rouge, *Proctor 21697* (GH). **St. Vincent.** Grand Bonhomme, *Morton 6132* (MICH, US); Grand Bonhomme, *Morton 6134* (GH, US).—CHARLOTTE: ESE ridge of Mt. Grand Bonhomme, *Proctor 26089* (A). **Costa Rica.** SAN JOSÉ: Vicinity of El General, *Skutch 2377, 2958* (US); Along unnamed N fork of Río Zurquí (upstream from highway, N of tunnel), Cordillera Central, 10°04' N, 84°01' W, *Smith et al. 1669* (MICH); Vicinity of Santa María de Dota, *Standley 44100* (US).

Table 2 (cont'd)

14. ***Amauropelta inabonensis*** (Proctor) O. Alvarez — **Puerto Rico.** CIALES: Cordillera Central: Toro Negro State Forest. Upper E slope near summit of Cerro Rosa, *Proctor & Haneke 44610* (US).—PONCE: Toro Negro Forest Reserve, trail along Río Inabón (from Rt 143, km 18.5), *Axelrod & Chavez 4312* (NY, US); Toro Negro Forest Reserve, headwaters of Inabón River due S of Rd. 143, km 18.8-18.9. 18°09'43" N, 66°34'32" W, *Acevedo-Rdgz & Breckon 7812* (NY, US).

15. ***Amauropelta rustica*** (Fée) O. Alvarez — **Guadeloupe.** BASSE TERRE: Along Trace Victor Hugues between Grande Découverte and savane aux Ananas, *Proctor 20236* (A, US); Bains Jaunes, *Stehlé 2428* (GH, US); Citerne, chemin Lac Flammarion, *Stehlé 1759* (US); Haut Matouba, prés du Morne Matelyane, *Pére Duss 4051* (US); Trace de la Matélis au Lac Flammarion (Grande Citerne), *Stehlé 2426* (MICH, NY, US). **Dominica.** Morne Trois Pitons. Rainforests on upper slopes, *Hodge 1411* (GH, NY, US); *Hodge 137* (GH, US); Mossy forests on northern ridges of Morne Diablotin, *Hodge & Hodge 2805* (GH, NY, US).—ST. JOHN: Morne Diablotin, NW ridge. *Webster 13331* (GH, US); *Webster 13361* (US).—ST. PETER: Morne Diablotins, Northern Forest reserve, trail to summit, NW side of peak, *Hill 24639* (NY, US).

16. ***Amauropelta hydrophila*** (Fée) O. Alvarez — **Guadeloupe.** Lac Flammarion (Citerne), *Stehlé 1445* (US); Massif Central, *Questel 1034* (US); Riviére Noire, *Pére Duss 4037* (NY).—BASSE TERRE: Along trail between Plateau de Papaye and Ravine Chaude, above Matouba, *Proctor 20151* (A, MICH, US). **Martinique.** Deux-Choux, *Pére Duss 4611* (NY).

17. ***Amauropelta antillana*** (Proctor) O. Alvarez — **St. Kitts.** Summit of Mt. Misery. *Britton & Cowell 529* (US). **Guadeloupe.** Trace du Lac Flammarion, *Stehlé 2429* (GH, US). **Dominica.** Rainforest borders between Laudat and Freshwater Lake, *Hodge & Hodge 1857* (GH, NY, US).

18. ***Amauropelta scalaris*** (H.Christ) Á.Löve & D.Löve — **Cuba.** SANCTI SPIRITUS: Mogote Mi Retiro, Loma El Mirador y alrededores de la casa de visita de la agricultura. Alturas de Trinidad, *Sánchez & Cuesta 74292 A-B* (BSC). **Mexico.** CHIAPAS: Municipio of Ocosingo; adjacent to Laguna Ocotal Grande, *Breedlove 32888* (MICH).—OAXACA: District of Villa Alta, valley of the Yelagago River, ca. 20 mi. NE of Villa Alta (17°25' N, 96°05 W). Dense forest from Hallberg ranch down to Yelagago River, *Mickel 1054* (MICH, US); District of Villa Alta, valley of the Yelagago River, ca. 20 mi. NE of Villa Alta (17°25' N, 96°05 W). In clearing at Hallberg ranch, *Mickel 1067* (MICH). **Colombia.** SANTA MARTA: Unknown locality, *Smith 1004* (MICH).

20. ***Amauropelta concinna*** (Willd.) Pic. Serm. — **Cuba.** GUANTÁNAMO: Farallones of La Perla, N of Jaguey, Yateras, *Maxon 4409* (US); Josephina, N of Jaguey, Yateras, *Maxon 4100* (US); La Perla, *Shafer 8569* (US); *Shafer 8577* (MICH, NY, US); *Shafer 8641* (GH, NY, US).—SANCTI SPIRITUS: Buenos Aires, Trinidad Mountains, *Morton 4158, 10313* (US); Mina Carlota, Trinidad Mountains, *Morton 10395* (US). **Haiti.** CAHOS: Vellée de Fer-á-Cheval, *Ekman H5573* (US).—NORD: Vicinity of Marmelade, *Leonard 8169* (GH, US).—SUD-EST: Massif de la Selle, Pétionville, Kenskoff, *Ekman H10101* (US). **Dominican Republic.** AZUA: Cordillera Central. Paraje La Pocilga, 18°39'27" N, 70°44'23" O, *De la Cruz & Veloz 169* (JBSD); Cordillera Central. Poblado rural de Pocilga, aprox. 1.5 km N de Sabana de San Juan, 18°39' N, 70°44' O, *Zanoni & Pimentel 22064* (JBSD, NY); Cordillera Central. San Juan, El Naranjo, *Ekman H13507* (US); Cordillera Central. San Juan, Loma La Vieja, at Arroyo de la

Table 2 (cont'd)

A. concinna cont'd
Vieja, *Ekman H13415* (US).—LA VEGA: Cordillera Central. Constanza, *Ekman H13980* (US).—MONTE CRISTI: Cordillera Central. Monción, Lagunas de Cenobí, *Ekman H12887* (US). **Jamaica.** PORTLAND: Rodnor, Blue Mountains, May 1926, *Davis s.n.* (MICH); Near Silver Hill Gap, *Maxon 1135* (US).—ST. ANDREW: Above Cedar Valley, along the parochial road to Silver Hill Gap, *Maxon 10322* (US); Green River, trail from Cinchona to Blue Mountain Peak, *Maxon 1501* (US); Green River, trail from Cinchona to Blue Mountain, *Underwood 2566* (NY); Near Hardware Gap, *Underwood 2271* (NY); Second Breakfast Spring, near Tweedside, *Maxon 989* (US); Tweedside, *Maxon 984* (US).—ST. THOMAS: Farm Hill Works, *Orcutt 3602* (US).—WESTMORELAND: Clarks Wood district, SE of Woodstock, *Proctor & Mullings 22005* (A, MICH, NY, US). **Mexico.** HIDALGO: Mun. Molango. Xochicoatlán, *González Quintero 1549* (MSC).—NUEVO LEON: Horsetail Falls, S of Monterrey, *Knobloch 1980* (MSC).—OAXACA: Dist. Teotitlán. Mun. San José de Tenango. San Martín Caballero, *Ingela 95-M102* (NY); Dto. Pochutla. 185 km S of Oaxaca, 60 km N of Pochutla, *Mickel & Leonard 5099* (NY); Mun. Huautla de Jimenez. Agua de Fierro; 3.5 km del Puente de Fierro por la terracería a Sta. María Chilchotla, *Munn-Estrada & Mendoza 1651* (NY).—VERACRUZ: Mun. Chocamán. 8.5 km by road W of Chocamán, at about the highest point on the gravel road to Xocotla, *Nee 23222* (GH). **Guatemala.** AMATITLÁN: Los Verdes, *Heyde & Lux 6286* (US).—BAJA VERAPAZ: Thicket along Río Frío near San Julián, *Williams et al. 43579* (GH).—PETEN: Dolores, 1 km E bordering Río Ixcol, *Contreras 2406* (US). **El Salvador:** Río Nunuapa by La Palma, *Seiler 256* (NY). **Costa Rica.** SAN JOSÉ: Aserrí, along road to hills, *Scamman 5955* (GH); Vicinity of El General, *Skutch 2597* (GH). **Panama.** CHIRIQUÍ: Río Quebrada, *Killip 5135* (GH). **Colombia.** CALDAS: Armenia, Cauca Valley, *Pennell et al. 8684* (GH).—EL VALLE: Río Digua valley, between La Elsa and Río Blanco, *Killip 34770* (US). **Ecuador.** CHIMBORAZO: Cañon of the río Chanchan near Huigra, *Camp E-3156* (GH). **Peru.** CUZCO: Prov. Convención. Potrero, 8 km W of Quillabamba, *Tryon & Tryon 5386* (GH); Prov. Convención. Rio Apurimac: below San Martin above Hacienda Luisiana, *Davis et al. 1335* (GH); Prov. Convención. Río Apurimac; below San Martín, *Davis et al. 1324* (GH).—HUANUCO: Dist. Churubamba. Hacienda Exito; slope to Río Ysabel, *Mexia 8184* (GH).—SAN MARTÍN: Prov. Mariscal Caceres. 60 km NE of Tingo María, "Divisoria" pass through Cerro Azul on Tingo Maria - Pucallpa road, *Tryon & Tryon 5266* (GH).

21. ***Amauropelta cheilanthoides*** (Kunze) Á.Löve & D.Löve — **Haiti.** SUD-EST: Massif de la Selle, Pétionville, Morne Tranchant, *Ekman H10025, H3210* (US). **Dominican Republic.** AZUA: Hispaniola. Civ. Santo Domingo: Sierra de Ocoa, San Jose de Ocoa, Bejucal, *Ekman H11807* (US).—INDEPENDENCIA: 18°40' N, 71°46' O. Sierra de Neiba: 34 km N de La Descubierta (o 14 km N de Angel Felix), en la parte E de "Cerros de Platon Ciquen"; recolectado en la orilla de la carretera de la frontera, *Zanoni et al. 24872* (NY).—LA ESTRELLITA: Near crest of Sierra De Neiba, along road between Angel Felix and Hondo Valle just N of Prov. Independencia boundary, *Proctor 39254* (NY); Sierra de Neiba, 31-34 km by road NNW of La Descubierta, 11-14 N of Angel Felix, *Mickel et al. 8818* (NY).—LA VEGA: 18°44' N, 70°44.5' O. 2 km S de la Ciudad de Constanza: en el patio del Hotel Nueva Suiza, *Zanoni et al. 20038* (NY); Cordillera Central, Reserva Científica Ebano Verde; en el valle del Arroyo Arroyazo, *Zanoni et al. 46339* (US); Cordillera Central: base Norte y subida de "Loma El Campanario" (=Pico de Piedra en el mapa), 4 aero-kilómetros W de La Culata de Constanza, un valle entre dos lomas; ladera de El Campanario, *Zanoni et al. 27565* (NY).—MONTE CRISTI: Cordillera central, [Manción], Río Cenobicito, *Ekman H12961* (US).—PERAVIA: Cordillera Central; 15

Table 2 (cont'd)

A. cheilanthoides cont'd
km Norte desde el Parque Central y 8 o10 km desde el cruce de Los Arroyos en el camino a Carmona: zona rural denominada "El Caliche" o "Carrao", 18°40' N, 70°32' O, *Zanoni et al. 21870* (NY); Cordillera Central: 20 km NW of Rancho Arriba, crossing Río Nizao twice, to end of road, 7.8 km after second river crossing, at Quita Pena; 1.5 hr walk N of Quita Pena to nearest forest, *Mickel et al. 9130* (NY). **Jamaica.** Unknown locality, 1874, *Jenman s.n.* (US); Unknown locality, *Hart 239, 309* (US).—ST. ANDREW: Supt. Govt. Cinchona Plantation, Gordon Town, *Hart s.n.* (US); Morse's Gap, Cinchona, *Faull 12633* (GH, US); Near Hardware Gap, *Maxon 1104* (US); *Underwood 2220* (NY); Slope of Catherine's Peak at Green Hills, *Chrysler 1930* (US). **Puerto Rico.** JAYUYA: Cerro de Punta, *Liogier 36843* (NY).—PONCE: Cordillera Central: Monte Jayuya. Summit area near telecommunications tower, *Proctor 40129* (US). **Mexico.** CHIAPAS: San Cristobal, *Münch 42* (US); Slope with Quercus on boundary between Zinacantán and Chamula along the road to Zinacantán Center, *Breedlove & Raven 8127* (US); Volcán Tacana, Union 'F. [Chis], *Matuda 2766* (GH).—GUERRERO: Sierra Madre del Sur, Distrito Mina. Petlacala; below mine Santa Elena, *Mexia 9003* (GH, US).—JALISCO: Sierra de la Campana, along road to Mascota, 7-8 miles NW of Los Volcanes, *McVaugh 13774* (US).—MICHOACAN: Locality Barroloso, District Coalcoman, *Hinton 15376* (GH).—VERACRUZ: La Perla, *Copeland 31* (GH); Tlaltongo, 10 km al SW de Huatusco, *Rzedowski 18988* (MSC). **Guatemala.** ALTA VERAPAZ: Chihób, *Johnson 884* (US); Mixed and secondary forests on hills along Río Chió about 2-4 km SW of Cobán, *Williams et al. 40720* (GH); Wälder in Panzamala (Forests of Panzamala), *von Türckheim 627* (US). **Costa Rica.** CARTAGO: Pacayas, at the foot of Volcán Turrialba, *Scamman 7107* (GH). **Panama.** CHIRIQUÍ: Mixed evergreen forest, 1.4 mi S of Cerro Punta, *Graham 291* (GH). **Peru.** CUZCO: Convención Distrito Vilcabamba - Trail Yupanqui to Río Apurimac. Rumichurco, *Davis et al. 1220* (GH); Convención. Río Apurimac - Mouth of Río Pampaconas, above Sinechinete, *Davis et al. 1287* (GH); Machu-Pichu, *Coronado 132* (GH).

22. *Amauropelta decrescens* (Proctor) O. Alvarez — **Jamaica.** PORTLAND: Blue Mountain Peak, *Faull 12621, 12634, 12620* (US); Blue Mts, near Whitfield Hall, *Faull 11670* (US); Lower western ridge of Blue Mountain Peak, *Maxon 10025* (NY).

23. *Amauropelta aliena* (C.Chr.) O. Alvarez — **Dominican Republic.** AZUA: Cordillera Central. Los Vallecitos del Yaque, *Ekman H13657* (US).—LA VEGA: Parque Nacional J. Armando Bermúdez: en "Compartición", donde está la casa de Parques Nacionales, aprox. 4 horas a pie antes del Pico Duarte, cerca del nacimiento (Cabecera) del Río Yaque del Sur, 19°02' N, 70°59' O, *Zanoni et al. 37610* (JBSD).

24. *Amauropelta firma* (Baker ex Jenman) O. Alvarez — **Haiti.** SUD-EST: Massif de la Selle; Marigot, rocky gorge of River Chota, *Ekman H5987* (US); Massif de la Selle, Ganthier, slope of Morne Courty, *Ekman H7622* (MICH, US); Massif de la Selle; Pétionville, Morne La Visite, *Ekman H10082* (NY, US). **Jamaica.** Unknown locality, 28 Mar 1850, *Alexander s.n.* (US); Unknown locality, 1874, *Jenman s.n.* (NY).—PORTLAND: Blue Mountain, 12 Jul 1932, *Papenfuss s.n.* (MICH, US); Blue Mountain Peak, *Underwood 1435* (NY, US); Blue Mountains, Monkey Hill, *Britton 1138* (NY); Peaks of Blue Mountains, *Hart 189* (US); Slopes of Monkey Hill (above New Haven Gap), *Maxon 2730* (US); Sugar Loaf Peak, summit area, *Proctor 4355* (US); Summit of Blue Mountain Peak, *Maxon 1438* (US); *Underwood 2553* (NY); Upper western ridge of Blue Mountain Peak, *Maxon 10005* (GH, US); Upper western ridge of Blue Mountain Peak, *Maxon 10010* (GH, NY, US).

Table 2 (cont'd)

25. ***Amauropelta manaiorum*** O. Alvarez — **Dominican Republic.** LA VEGA: Cordillera Central: 6 km desde el poblado rural de La Sal en el camino a La Palma, sobre la Loma La Golondrina. 19°04' N, 70°34' O, *Zanoni et al. 20080* (JBSD).—LA VEGA-SAN CRISTOBAL-PERAVIA: 10 km de Rancho Arriba en la carretera a Piedra Blanca y 4 km SE hasta Mahoma y Río Mahoma. Colectada en las orillas del Río Mahoma entre Mahoma y la cabecera del mismo río. 18°43.5' N, 70°22' O, *Zanoni et al. 22936* (JBSD).—MONSEÑOR NOUEL: En la subida de Jayaco (de Bonao) a El Río (de Constanza), aprox. 8 km al oeste de la Carretera Duarte (Santo Domingo-Santiago): orilla del Río Jatubey. 19°02' N, 70°30' O, *Zanoni & Jiménez 40445* (JBSD).

26. ***Amauropelta ekmanii*** (A.R. Smith ex Lellinger) O. Alvarez — **Dominican Republic.** PERAVIA: Cordillera Central: 42.7 km al NE de San José de Ocoa, entrando por La Nuez en el camino hacia la Yerba Buena, hasta el antiguo aserradero de Santiago Infante (Chago), nacimiento del Río Las Cuevas, en la base del Monte Tetero de Mejía. 18°38' N, 70°36' O *Mejía et al. 639* (JBSD).

27. ***Amauropelta basisceletica*** (C. Sánchez, Caluff & O. Alvarez) O. Alvarez — **Cuba**. GRANMA: Buey Arriba, alrededor del poblado Barrio Nuevo, *Meyer 64343* (HAC); Municipio Guisa, La Bayamesa, Sierra Maestra. Desde el campamento El 9 hasta la cima del Pico La Bayamesa, *Sánchez et al. 82028* (HAJB).—SANTIAGO DE CUBA: Corojo, Treinta Pinos, *Ekman 5188* (NY, US); Sierra Maestra, on the divide between Loma Joaquin and Punta de Palmamocha, *Ekman 5334* (US); Sierra Maestra, on the divide between Rio Yara and Rio Palmamocha, between the last of the "picachos" and the foot of Loma Joaquin, *Ekman 14440* (US); Southern Oriente and Pico Turquino. Wet woods, Maestra ridge, *Leon & Ekman 11123* (NY, US); Loma del Gato et environs, El Cobre, Sierra Maestra, *Clement 1729* (US); Picachos de la Alta Maestra, *León 11123* (HAJB, US); Pico Turquino, Sierra Maestra, *Acuña 9962* (HAJB).

28. ***Amauropelta deminuta*** O. Alvarez — **Dominican Republic.** AZUA: Cordillera Central: el poblado rural de Pocilga, aprox. 1.5 km N de Sabana de San Juan. 18°39' N, 70°44' O, *Zanoni & Pimentel 22083* (JBSD); Cordillera Central: arriba de la Loma Arroyo Hondo; entre Sabana de Miguel Martín y El Cercado. 18°38' N, 70°43' O, *Zanoni & Pimentel 22190* (JBSD).—LA VEGA: Cordillera Central: Salto de Agua Blanca, 9.5 km S of Constanza via El Convento on the road to San José de Ocoa, and 4 km E towards the falls and balneario, *Mickel et al. 8503* (JBSD).—PERAVIA: Cordillera Central: Loma Piedra Blanca al oeste de Las Cayas, 3 horas caminando a pies hacia el suroeste de La Horma, San José de Ocoa, nacimiento del arroyo Las Cayas. 18°36' N, 70°35' O, *Mejía et al. 955* (JBSD).

30. ***Amauropelta namaphila*** (Proctor) O. Alvarez — **Puerto Rico.** SAN GERMÁN: Maricao to Monte Alegrillo, Mt. Alegrillo *Britton et al. 2612* (NY, US).

31. ***Amauropelta sancta*** (L.) Pic. Serm. — **Cuba.** PINAR DEL RÍO: Sierra del Rosario, Bosque Rangel, *Alaín 18, 650, 1915* (HAC), *Alaín 1916* (HAJB); Sierra del Rosario, Valle Taco Taco, *León 12510* (HAC); Sierra del Rosario, *Acosta 34* (HAJB); Pan de Guajaibón, *Acuña 10773* (HAJB); Candelaria, Soroa, barranco húmedo en la finca Esperanza, 8 km al norte de Soroa, *Bässler et al. 36205* (HAJB); Candelaria, naranjal en el camino de las Terrazas, *Alvarez et al. 55494* (HAJB).—HABANA: Colinas cerca de Güines, *Clemente 432* (HAC).—CIENFUEGOS: Loma de la Ventana, *León 13938* (HAJB); *Muñiz et al. 1318* (HAC); San Blas, *Jack 6447* (HAC);

Table 2 (cont'd)

A. sancta cont'd
Sierra del Escambray, Matagua de la Vega, manantial de la carretera de San Blas, *Bisse et al. 1108* (HAJB).—SANCTI SPIRITUS: Topes de Collantes, *Acuña 11404* (HAC); Sierra Gavilanes, *Maxon & Morton 12215* (HAC); Lomas de Banao, *Areces et al. 28797* (HAC); Sierra del Caballete, *León & Clement 6542* (HAC); Arrollo Vega Grande, Topes de Collantes, *Alaín 6734* (HAC); Lomas de Banao, *Babrov & Cárdenas 29845* (HAC); Buenos Aires, Lomas de Trinidad, *Morton 10384* (HAC); Río Jatibonico del norte, Venegas, *León 16713* (HAC); Fomento, Loma Gavilanes, Alto del Jobo, *Bisse et al. 41116* (HAJB); Camino de Pedrera a Gavilanes, *Bisse et al. 048484* (HAJB); Falda sur de las lomas de Banao, en el barranco de un arroyo, *Alvarez et al. 28793* (HAJB); Banao, camino entre el monumento de Cantú y tope de la Diana, *Arias et al. 59760* (HAJB); Topes de Collantes, a los bordes de una cañada, debajo del acueducto, *Granda et al. 25178* (HAJB).—HOLGUÍN: Cuenca del río Levisa, Sierra Cristal, *Alaín et al. 5759*, *4607* (HAC); Falda norte de la Sierra Cristal, cafetales 4 Km al suroeste de El Culebro en la zona de Brazo Grande, *Mory 61427* (HAJB), *Bässler et al. 61012* (HAJB); Moa, La Melba, *Leyva et al. 58228* (HAJB); Moa, cerca de Arroyo Bueno, *Bisse 15366* (HAJB).—SANTIAGO DE CUBA: El Cobre, cerca de la casa de Hermelia Casas, *Caluff 7033* (HAC); Arroyo cerca de Dos Bocas, *Alaín 3569* (HAC); Loma del Gato, *Clement 1363* (HAC); Villalón, Gran Piedra, *Caluff 100* (HAJB); San José, subida norte de la Loma del Gato, *Caluff 374* (HAJB); Segundo Frente, Arroyo en el camino del Halcón a Los Jagüeyes, *Sánchez 57605* (HAJB); Segundo Frente, camino entre el Halcón y las cabezadas del río Lebisa, al sur del Pico Cristal, *Alvarez et al. 56560* (HAJB).—GUANTÁNAMO: Baracoa, *León 11882* (HAC); Norte de Jagüey, Yateras, *Maxon 4096* (HAC, US); Subida al Yunque de Baracoa, *Caluff 51736* (HAJB); San Antonio de los Indios, *Bisse et al. 9919* (HAJB); Baracoa, Sierra de Imías, *Bisse et al. 8919* (HAJB); Monte Verde, *Wright 822* (HAC).—Isla de la Juventud: Along arroyo bank near Santa Fe, *Jennings 560* (US, NY). **Haiti.** ARTIBONITE: Vicinity of Ennery, SW of Ennery, *Leonard 9026* (GH).—OUEST: Chardonette, Arrondissement de Jérémie (several km SW of Beaumont, N of divide at lower edge of the pine forest, off the main road from Les Roseaux to Les Cayes), *Bartlett 17335* (GH, MICH, US). **Dominican Republic.** BARAHONA: Trail between Pedernales and Aceitial, *Howard & Howard 8176* (GH).—PUERTO PLATA: Cordillera Septentrional: Arroyo Ancho, 7.1 km al E de Tabagua, en la Cañada de la Cueva, 19°40' N, 70°40' O *Mejía & García 1511* (GH). **Puerto Rico.** Prope Pepino ad Eneas, *Sintenis 5828* (MSC).—FLORIDA: 5 km S of Florida; limestone ledges and cliffs along rt. 140, Km. 51, *Montgomery 9059d* (MSC).—LUQUILLO: Along the La Mina Falls trail, Luquillo National Forest, *Howard et al. 15560* (GH); Sierra de Luquillo, en monte Jimenes, *Sintenis 1753* (GH).—MARICAO: Bo. Indiera Fría, Maricao Forest Reserve, trail from Rt 425 to Salto de Curet, *Escobar et al. 3621* (NY).—SAN GERMÁN: Maricao State Forest, *Liogier 9823* (US).—UTUADO: Utuado, in praeruptis ad los Angeles, *Sintenis 5956* (GH). **Dominica.** Prope Laudat, *Eggers 456* (US); Moist forests in valley of Hampstead River, ca. 2 miles from mouth La Chaudiere, *Hodge & Hodge 3568* (US); High-stem rainforests, Milton Estate, *Hodge & Hodge 2881* (US).—ST. JOSEPH: B.W.I.: Banks of Layou River, Clarke Hall Estate, *Webster 13400* (GH, US).

32. *Amauropelta rheophyta* (Proctor) O. Alvarez — **Dominican Republic.** LA VEGA: Cordillera Central: 12 km de la carretera Duarte (Santo Domingo - Santiago) en la carretera a El Río y Constanza: "Casabito", en el valle del Río Jalubey, *Zanoni et al. 23030* (NY).—SAN CRISTOBAL: Prov. San Cristobal- Peravia border: Cordillera Central, broad-leaved forest (much cut over) along Río Mahoma, 5.3 km E of Piedra Blanca - Rancho Arriba road, (from point 19 km

Table 2 (cont'd)

A. rheophyta cont'd
SW of Piedra Blanca, 11.2 km NE of Rancho Arriba, 0.7 km NE of La Penita), *Mickel et al. 9062* (NY).—SAN JOSÉ DE OCOA: Entre las piedras, a orillas del río Yuna, Rancho Arriba - San José de Ocoa, *Liogier & Liogier 25548* (NY). **Puerto Rico.** Portorico, *Eggers 733* (US).—ARECIBO: Barrio Esperanza: vicinity of Observatorio de Arecibo. In limestone gorge beside Río Tanamá, *Proctor et al. 40250, 40256* (US).—CIALES: Bo. Toro Negro, Rt 533, c. km 2, ravine up N slope of Los Tres Picachos, *Axelrod & Stenzel 11147* (US).—JAYUYA: Cordillera Central: Barrio Saliente. Mountain slopes 1-1.2 km due WNW of Cerro Rosa, *Proctor & Haneke 41415* (US).—LUQUILLO: Eastern slope of the Luquillo Mountains, *Heller 4614* (NY); Slopes of El Yunque, 28 May 1944, *Wagner, Jr. s.n.* (US).—MARICAO: La Juanita, near Las Marias, *Britton et al. 3937* (NY); Barrio Indiera Fría: near base of El Salto de Cruet, *Proctor & Padrón 45683* (US).—NAGUABO: Caribbean National Forest. S off Rt. 191, along c. 1 km stretch up Río Sabana, *Axelrod & Axelrod 7109* (US); Bo. Rio Blanco, Caribbean National Forest, along 1 km stretch up Rio Sabana S of closed portion of Rt 191, *Axelrod & Chavez 3240* (NY); Sierra de Naguabo, mouth of Rio Icaco to Big Falls, *Shafer 3177* (NY).—RIO GRANDE: Caribbean National Forest, Rt 186, c. km 14, along 1 km stretch up stream (SW of Quebrada Grande), *Axelrod & Axelrod 2817* (NY); Sierra de Luquillo: Caribbean National Forest. Road 191, km 9.9 at Quebrada Juan Diego, *Proctor 39603* (US); Sierra de Luquillo: Caribbean National Forest. Upper course of Río Grande above Road 186, *Proctor 40719* (US); Sierra de Luquillo, Caribbean National Forest, Quebrada Sonadora above crossing of Road 186, *Proctor & Pinto 40172* (US).

33. ***Amauropelta physematioides*** (Kuhn et H.Christ) O. Alvarez — **Dominican Republic.** AZUA: Cordillera Central; San Juan, Lomas de la Mediania, Sabana Nueva, *Ekman H13614* (US).—BAORUCO: Sierra de Neiba, Sabana del Silencio, 18°39'07" N, 71°33'26" O, *Acevedo-Rodriguez et al. 13007, 13017* (JBSD).—ELIAS PIÑA: Sierra de Neiba, aprox. "km 209" (al N del Puesto Militar Cacique Enriquillo) en la Carretera Internacional, 18°41' N, 71°46' O, *Zanoni et al. 40063, 40078* (JBSD).—LA VEGA: Cordillera Central. Arroyo Pescozón; 1.3 km E desde el Puesto Militar de Valle Nuevo en la carretera a Pico Alto de La Bandera, cerca del río, 18°47' N, 70°38' O, *Zanoni & Pimentel 20719* (JBSD).—SAN JOSÉ DE OCOA: La Nevera, *Liogier 25681* (JBSD).—SAN JUAN: Fern growing in deep water of Sabana Nueva. Piedra del Aguacate to Rio del Oro, *Howard & Howard 9159* (MICH, US); Cordillera Central. Parque Nacional Bermúdez: en el Valle de Bao (que está entre Pico Duarte y Mata Grande), al fondo del valle, cerca del Río Bao, 19°03' N, 71°02' O, *Zanoni & García 41720* (JBSD, US).—SAN RAFAEL: Vicinity line between provinces of San Rafael and Independencia, Sierra de Neiba, along the Carretera Internacional near the crest of the range, along the Haitian border, *Gastony & Jones 574* (US).

34a. ***Amauropelta piedrensis*** (C.Chr.) O. Alvarez var. ***piedrensis*** — **Cuba.** SANTIAGO DE CUBA: Cañada al N del Ermitaño, Gran Piedra, *Caluff & Shelton 2777* (BSC); Camino a la Gran Piedra, *Clement 6537* (US); Gran Piedra, *Clement 7158, 7159* (US); En un camino. Monte Gran Piedra, *Clement 6632* (US); Camino de Olimpo a la Gran Piedra, Sierra Maestra del Este, *Clement 6463, 6464* (US); En la Finca "La Idalia", region de la Gran Piedra, *Lopez-Figueiras 445* (US); Bordes de caminos en la zona de "La Idalia", region de la Gran Piedra, *Lopez-Figueiras 427* (US); Alrededores del Alto del Olimpo, en la carretera a la Gran Piedra, *Lopez-Figueiras 395* (US); Firmeza to Gran Piedra, *Shafer 8947, 8987* (A, NY); Firmeza to Gran Piedra, *Shafer 8954* (A, GH, NY). **Haiti.** ARTIBONITE: Vicinity of Ennery, *Leonard 9150* (US). **Dominican Republic.** SANTIAGO RODRÍGUEZ: N side of Cordillera Central, Arroyo Caña, 27 km SW of Cepillo, part of Monción, 1 km past pueblo of Aguacate, *Mickel et al. 8611* (NY).—

Table 2 (cont'd)

A. piedrensis var. *piedrensis* cont'd
SANTIAGO: Cordillera Central: Municipio San José de las Matas, Paraje Mata Grande, Parque A. Bermúdez en loma de Barranca, *Clase & Peguero 887* (JBSD); Distr. San José. Arroyo Calimete, Loma Bajita, *Valeur 898* (NY, US). **Puerto Rico.** ADJUNTAS: Monte Cerrote, near Adjuntas, *Britton & Brown 5390* (NY, US); Cordillera Central: N slope of La Silla de Calderón, *Proctor 39348* (US); Cordillera Central: Monte Guilarte State Forest. Along trail to summit of Monte Guilarte, *Proctor 40105* (US).—CIALES: Toro Negro Recreational Area, 3 Jan 1978, *Tullis s.n.* (GH); Barrio Toro Negro: Road 144, km 14.2, *Proctor & Pinto 40565* (US).—JAYUYA: Cordillera Central: Barrio Veguitas. Lower W slope of Piedra Blanca, *Proctor & Haneke 41018* (US); Cordillera Central: Toro Negro State Forest. Barrio Veguitas, Río Saliente headwaters ravine between Monte Jayuya and Piedra Blanca, *Proctor & Haneke 40375* (US).—MARICAO: Maricao, *Hess 347* (US).—SALINAS: Barrio Lapa: vicinity of Las Tetas de Cayey, *Proctor 42819* (US).—SAN GERMÁN: Maricao State Forest: Road 120, mountain slope just S of Lookout Tower, *Proctor 39660* (US); Maricao State Forest: Vicinity of Campamento Buena Vista, *Proctor & Padrón 40839* (NY, US).—UTUADO: Barrio Tetuán: upper NE slopes and summit of Cerro Morales, *Proctor 41343* (US).

34b. ***Amauropelta piedrensis*** var. ***heterotricha*** (Caluff & C. Sánchez) O. Alvarez — **Cuba.** SANTIAGO DE CUBA: Alto del Ermitaño, Gran Piedra, *Caluff 1795* (BSC).

34c. ***Amauropelta piedrensis*** var. ***quisqueyana*** O. Alvarez — **Haiti.** OUEST: Vicinity of Furcy, *Leonard 4624* (US). **Dominican Republic.** LA VEGA: El Montazo, from Constanza to Valle Nuevo, *Liogier 15418* (NY); Cordillera Central: 4 km Oeste de La Culata de Constanza, Loma El Campanario. 18°57.5' N, 70°48' O, *Zanoni et al. 23245* (JBSD, NY).—PUERTO PLATA: En bosque en ladera N, cerca de la cumbre del Isabel de Torres, *Liogier et al. 23469* (JBSD).—VALVERDE-SANTIAGO: Cordillera Septentrional: sobre Loma (pico) El Murazo (cima). 19°41' N, 70°58' O, *Zanoni et al. 32802* (JBSD).

35. ***Amauropelta hastiloba*** (C.Chr.) O. Alvarez — **Haiti.** SUD-EST: Morne de la Selle, Grand Gosier, Morne des Commissaire, *Ekman H6891* (US); Morne de la Selle, Pétionville, northern slope of Morne La Visite, *Ekman H7990* (US). **Dominican Republic.** PEDERNALES: Sierra de Baoruco, 7.2-7.7 km S of ridge top 4.8-5.3 km N of Los Arroyos on Jimaní-Pedernales road. *Mickel et al. 8921*, *8922* (JBSD).

36a. ***Amauropelta scalpturoides*** (Fée) O. Alvarez var. ***scalpturoides*** — **Cuba.** PINAR DEL RÍO: In mountains near El Guamá, *Palmer & Riley 195* (NY, US).—SANCTI SPIRITUS: Trinidad Mountains: On a rocky crest, near Pico Potrerillo, *Alaín 6456* (US); Sancti Spiritus Mountains: Sierra del Caballete, *Leon & Clement 6527* (NY); Sancti Spiritus Mountains: Sierra del Caballete, *Leon & Clement 6582* (NY); Banao Mountains: Woods near the top of Loma La Gloria, *Leon & Roca 7976* (NY, US); Sancti Spiritus Mountains: Loma La Gloria to Gavilanes, *Luna 7666* (NY).—SANTIAGO DE CUBA: Sierra Maestra: Loma del Gato and vicinity, *Hioram & Clement 6454* (US).—GUANTÁNAMO: Bayate, *Hioram 6454* (A, US); La Prenda, *Hioram & Maurel 4712* (US); Sierra de Imías: Wooded top of Puntón del Mate, *Leon 12292* (NY); Prope villam Monte Verde dictam, Cuba Orientali, *Wright 814* (GH).—ISLA DE LA JUVENTUD: Vicinity of Columbia, wet woods, Majagua, Río Mal País, *Britton et al. 15723* (US); Along arroyo bank near Santa Fe, *Jennings 560* (GH, MICH, NY, US).

Table 2 (cont'd)

36b ***Amauropelta scalpturoides*** var. ***glabriuscula*** (C. Sánchez & Caluff) O. Alvarez — **Cuba.** SANTIAGO DE CUBA: Camino a la Gran Piedra, *Clement 7549* (US); Monte de la Gran Piedra, *Clement 6630* (US).—GUANTÁNAMO: Cabezadas del río de Mula, Cupeyal del Norte, *Caluff & Fagilde 2176* (BSC).

36c. ***Amauropelta scalpturoides*** var. ***angustifolia*** O. Alvarez — **Cuba.** In Cuba Orientali, *Wright 3925* (US).

37. ***Amauropelta flabellata*** O. Alvarez — **Dominican Republic.** AZUA: Loma Nalga de Maco, *Ekman H6307* (US); Cordillera Central: el poblado rural de Pocilga, aprox. 1.5 km N de Sabana de San Juan. 18°39' N, 70°44' O, *Zanoni & Pimentel 22081* (JBSD).—PERAVIA: Cordillera Central: Municipio San José de Ocoa, Paraje Sabana Miguel Martín. 18°39'12" N, 70°43'11" O, *De la Cruz & Veloz 160* (JBSD).

38. ***Amauropelta rupicola*** (C.Chr.) O. Alvarez — **Haiti.** Savane Zombie, *Pride 181* (GH).—ARTIBONITE: Vicinity of Kalacroix, Sect. Dessalines, *Leonard 7862* (US).—OUEST: Massif des Cahos, group Las Caobas, Chapelle Ste-Claire, *Ekman 5539* (US); Massif des Matheux, Grands-Bois, La Toison, *Ekman H5705* (US); Vicinity of Dominican Republic-Haiti border, E of St. Pierre, *Gastony et al. 512* (US); Vicinity of Mission, Fonds Varettes, *Leonard 3874*, *3878*, *3896* (US); Vicinity of Furcy, *Leonard 4305*, *4460*, *4567* (US); Vicinity of Furcy, "Boncandíe River", *Leonard 4413*, *4414*, *4436* (US); Vicinity of Furcy, Morne de Weyan, *Leonard 4487*, *4698* (US); Summit of Morne Guimby, above Morne des Commissaires, *Proctor 10735* (US).—SUD-EST: Massif de la Selle, Pétionville, Fourcy, *Ekman H1308* (US); Massif de la Selle, Croix-des-Bouquets, Badeau, *Ekman H7641* (US); E Morne La Selle, *Holdridge 1988* (MICH, US). **Dominican Republic.** AZUA: Cordillera Central, Loma Nalga de Maco, *Ekman H6308* (US).—BAORUCO: Sierra de Neiba, Sabana del Silencio. 18°39'07" N, 71°33'26" W, *Acevedo-Rodriguez et al. 13170*, *13188* (JBSD).—INDEPENDENCIA: Sierra de Neiba, between Angel Felix and Aniceto Martínez, in vicinity of the military post. 18°41.626' N, 71°46.929' W, *Acevedo-Rodriguez et al. 13269*, *13361* (JBSD); Sierra de Neiba: 34 km N de La Descubierta (o 14 km N de Angel Felix), en la parte este de "Cerros de Platon Ciquen", recolectado a la orilla de la carretera de la frontera. 18°40' N, 71°46' O, *Zanoni et al. 24862* (JBSD, US); Sierra de Baoruco: en Charco de la Paloma. 37.4 km al "sur" de Puerto Escondido en el camino a Aceitillar y continuando en el camino a Aguacate. 18°12' N, 71°32' O, *Zanoni et al. 33923* (JBSD).—PEDERNALES: Sierra de Baoruco, 46 km N of the port of Cabo Rojo (Alcoa Exploration Company) on company road past Las Mercedes and Aceitillar mine sites at Las Abejas (11 km W of Aceitillar on back road), *Mickel et al. 8181* (JBSD); Sierra de Baoruco, 45 km road S of Jimaní-Duverge hwy (Cruce del Escondido) and 8 km S of El Aguacate, 7.2 km N of the ridge top. *Mickel et al. 8830* (NY); Sierra de Baoruco, 3.1 km N of the ridge top, 12 km S of El Aguacate, *Mickel et al. 8902* (JBSD); Sierra de Baoruco, 4 km S of the ridge top of the Jimaní-Pedernales road, 8.4 km N of Los Arroyos, *Mickel et al. 8917* (JBSD).—SAN RAFAEL-INDEPENDENCIA: Sierra de Neiba, along the Carretera Internacional near the crest of the range, along the Haitian border, vic. line between provinces of San Rafael and Independencia, *Gastony et al. 575*, *576* (US).

39. ***Amauropelta gracilenta*** (Jenman) O. Alvarez — **Jamaica.** PORTLAND: Ridge 2 miles northeast of High Peak, above Murdocks gap, *Proctor 5824* (IJ); John Crow Peak, *Watt 204* (US).—ST. ANDREW: Clydsdale, *Adams 7761* (IJ); St. Helen's to Morce's Gap, Blue Mountain

Table 2 (cont'd)

A. gracilenta cont'd
range, *Chrysler 4538* (US); Cinchona, *Clute 101* (GH, US); Moody's Gap, *Clute 173* (NY, US); Vicinity of New Haven Gap, *Maxon 2659* (US); Vicinity of St. Helens Gap, *Maxon & Killip 636, 1338* (GH, US); Vicinity of St. Helens Gap, *Maxon & Killip 1355* (GH); Upper slope of John Crow peak, Blue Mountains, *Proctor 22685* (IJ, MICH).

40. *Amauropelta nockiana* (Jenman) Pic. Serm. — **Jamaica.** CLARENDON: Knox College, Spaldings, *Proctor 6328* (IJ); Summit area of Croft Mountain, *Proctor 29967* (IJ); Glenwood springs, along road between Balcarres and Sunbury, *Proctor 35636, 35665* (IJ).—MANCHESTER: Wales, 1 mile east of Newport, *Proctor 6049* (IJ); 1/2 miles northwest of Christiana, *Proctor 11047* (IJ).—PORTLAND: Hardwar Gap, along trail toward the waterfall, *Proctor 4413* (IJ); "Muriel's Rock", along road between Section and Hardwar gap, *Proctor 23404* (IJ); Vicinity of Middleton Gap, *Proctor 34656* (IJ).—ST. ANDREW: Greenwich Bridle road, *Adams 6897* (IJ); Hermitage Dam: on moist rocky bank in lower ravine of the Moresham River, *Proctor 3910* (IJ); Tweedside, above Mount Airy, *Proctor 4431, 4434* (IJ); Charlottenburg, Port Royal Mountains, *Proctor 7011* (IJ); Chestervale, *Proctor 23527* (IJ); Along track between Bellevue and Mount Rosanna, Port Royal Mountains, *Proctor 23595* (IJ); Vicinity of Bellevue, Port Royal Mountains, *Proctor 23604* (IJ); West slopes of Fox's Gap, *Proctor 28517* (IJ).—ST. ANN: Along road to Hollymount, north slope of Mount Diablo, *Proctor 22645* (IJ); Douglas Castle district, near sink of the Blue River, *Proctor 23376* (IJ).—ST. CATHERINE: Vicinity of Hollymount, Mount Diablo, *Proctor 4050* (IJ); Northeast slope of Juan de Bolas, *Proctor 7122* (IJ).—ST. MARY: Northeast slope of Cum See Hill, above Longroad P. O., *Proctor 5381* (IJ); Along trail north of Fox's Gap, *Proctor 35594* (IJ); Along trail north of Fox's Gap, *Proctor 35595* (IJ).—ST. THOMAS: Whitfield Hall, *Proctor 4177, 5148, 5149* (IJ); Monkey Hill, south spur of Mossman's peak, Blue Mountains, *Proctor 6808* (IJ); Along forestry road north of Union Hill, *Proctor 37354* (IJ).

41. *Amauropelta shaferi* (Maxon & C.Chr.) O. Alvarez — **Cuba.** HOLGUÍN: Bosques húmedos de la falda S de la Sierra de Cristal, *Alaín et al. 5524* (HAC, US); Moa, La Veguita, Monte La Breña, alrededores del campamento Los Carboneros, *Bisse et al. 44387* (HAJB); Moa, La Veguita, orillas del río Limones, *Bisse et al. 44627, 45113* (HAJB); Sierra de Nipe, orillas del arroyo Guayabo, *León et al. 19778* (HAC); Sierra de Nipe, Loma Mensura, *Ekman 5747* (NY); Camp La Gloria, S of Sierra de Moa, *Shafer 8094* (NY).—SANTIAGO DE CUBA: Segundo Frente, subida al firme del Pico Cristal, cerca del Canadá, *Alvarez et al. 56879* (HAJB); Exploración de la región de la Sierra de Cristal, charrascos y cumbres del cristal, *Alaín et al. 5624* (HAJB); Segundo Frente, falda sur de la Sierra Cristal, cabezadas del arroyo Cristal, *Caluff 51612* (HAJB); Sierra Cristal. Cañada entre La China y La Zanja, *Caluff & Shelton 4695* (BSC); Sierra Cristal. Márgenes del Río Lebisa, *Caluff & Shelton 4697* (BSC).

42. *Amauropelta limbata* (Sw.) Pic. Serm. — **Saba.** Summit area of Mt. Scenery, *Proctor 44684* (A). **St. Kitts.** Mt. Misery, at the summit, *Box 289* (US); Summit of Mt. Misery, *Box 295* (US); Mt. Misery, *Box 299* (US); Belmont Estate, *Britton & Cowell 397* (NY, US); Slopes of Mt. Misery, *Britton & Cowell 560* (US); NW rim of The Crater, *Proctor 19505* (A); Upper slopes and summit of Mt. Misery, *Proctor 19625* (A, US). **Nevis.** Summit of Nevis Peak, *Proctor 19344* (A). **Guadeloupe.** Unknown locality, 1862, *L'Herminier s.n.* (A, US). **Martinique.** Morne Coco, *Hahn 23* (GH); Morne St. Denis, Valleé du Carbet, *Pére Duss 1579* (US); Bord de la

Table 2 (cont'd)

A. limbata cont'd
riviere Noire au environs du Sault de Constantine, *Pére Duss 4399* (NY); Morne Calebasse, N of Morne Rouge, *Proctor 21808* (GH). **St. Vincent.** ST. DAVID: Crater Lake, at base of cliffs just above surface of lake, *Cooley 8417* (GH).

43. ***Amauropelta cooleyi*** (Proctor) O. Alvarez — **St. Vincent.** Cumberland Mountain, *Morton 5836* (US); Mount Brisbane, *Morton 5965* (US); Unknown locality, *Smith & Smith 1360* (GH).—CHARLOTTE: The Soufriere, *Beard 1366* (GH, US); SW slope of Soufriere Mountain up from Rabacca, *Cooley 8214* (GH); Along road to Farm on bank of road cut, *Cooley 8591* (GH).—ST. DAVID: Soufriere Mountain, Crater Lake, *Cooley 8445* (GH, NY); Slopes of the Soufriere Soma. Ridge N of the Soufriere Crater, *Howard 11206* (US).

44. ***Amauropelta consanguinea*** (Fée) O. Alvarez — **Puerto Rico.** RIO GRANDE: Sierra de Luquillo: Caribbean National Forest. Road 191, km 12.3, *Proctor 39373* (US). **Guadeloupe.** Unknown locality, *Pére Duss 4410* (GH, US); [Trisabondnut daus] les lits et sur les talus de presque [bontes] les rivieres de la Guadeloupe, *Duss 4081* (US); Unknown locality, *Herminier 154* (GH); [Dumba], *Questel 2963* (US); Riviere [Noire], *Questel 2944* (US); [Sauh les] Constantin, *Questel 2748* (US); S[aut] du Constantin, *Questel 2747* (US); St.Claude/[Dun], *Questel 1138* (US); Ravine Grande-Ansé, *Stehlé 2065* (US); Ravine Malanga, *Stehlé 1446* (US).–-BASSE TERRE: Vicinity of Saut d'Eau de Matouba, *Proctor 20393* (GH); Dolé, *Proctor 20122* (GH, MICH, US). **Dominica.** S slope of Morne Macaque (Micotrin) on road to Fresh Water Lake, *Ernst 1497* (GH); Near Trafalgar Falls, upper Roseau River Valley, *Ernst 1081* (US); Rainforest bordering Imperial Road, Sylvania, *Hodge 1107* (GH); Lisdara, *Hodge 127* (GH); Moist forests in valley of Hampstead River, ca. 2 miles from mouth. La Chaudiere, *Hodge & Hodge 3528* (GH); Pegoua River in vicinity of Deux Branches, Concorde Valley, *Hodge & Hodge 3474* (GH); Steep, wet, north, valley walls near base of Roseau Valley Waterfalls (below Laudat), *Hodge & Hodge 2027* (GH); Rainforest borders between Laudat and Fresh Water Lake, *Hodge & Hodge 1816* (GH); Wet, wooded ravine at base of the twin waterfalls of Massacre River, between Sylvania and Mt. Joy, *Hodge & Hodge 1363* (GH); Mountain rainforests along Castle Bruce track, vicinity of N base of Trois Pitons, *Hodge & Hodge 1218* (GH); Laudat, *Lloyd 24, 178* (US); "Sylvania", *Proctor 104* (US).—ST. GEORGE: Along the old trans-island road, at the Fresh Water Lake, SE flank of Morne Micotrin, *Chambers 2744* (NY, US); N side of Fresh Water Lake, *Lellinger 430* (GH, US); Vicinity of Fresh Water Lake, near Laudat, *Smith 10232* (US).—ST. PATRICK: Trail to Sari-Sari Falls along Sari-Sari River from La Plaine, *Hill 25724* (NY, US).—ST. PAUL: Terrestrial on floor of forest. Common, *Cooley 8755* (NY); In the ravine of the Springfield River above the road, ca. 0.5 mi S of Pont Cassé, *Lellinger 374* (MICH, US); Ravine 0.3 mile SSW of Pont Cassé, *Proctor 25771* (GH). **Martinique.** [Sur nne] terre rocaillense aus environs du [Saus] de Constantin, *Duss 4386* (US). **Grenada.** ST. MARK: NW slope of Mt. St. Catherine, *Proctor 17248* (GH, US).

45a. ***Amauropelta balbisii*** (Spreng.) O. Alvarez var. ***balbisii*** — **Cuba.** PINAR DEL RÍO: Vicinity of Sumidero, *Shafer & Leon 13649* (GH, NY, US).—CIENFUEGOS: Sierra San Juan, above San Blas, *Morton 4129* (US); Trinidad Mountains. San Blas-Buenos Aires. Arrollito de Jinblito, *Gonzales 585* (GH); Trinidad Mountains. San Blas-Buenos Aires, *Hodge & Howard 4692* (GH).— SANCTI SPIRITUS: Banao, camino entre el monumento de Cantú y Tope de La Diana, *Arias et al. 59824, 59828* (HAJB); Sierra San Juan, *Maxon & Morton 12217* (HAC).—

Table 2 (cont'd)

A. balbisii var. ***balbisii*** cont'd
GRANMA: Buey Arriba, Pico Arriba, *Alvarez et al. 64968* (HAJB); Buey Arriba, Pico Verde, *Alvarez et al. 64880* (HAJB); Río Nuevo Mundo, La Bayamesa, *Caluff 2352* (HAJB).—HOLGUÍN: Moa, Km 26 de la carretera de La Melba, orillas del arroyo, cerca del caserío viejo, *Oviedo et al. 69040, 69045* (HAJB); Sierra de Cristal, aserrío Palenque, entre aserrío y río Cabonico, *Bisse et al. 45348* (HAJB); Moa, La Mella, *Leyva et al. 58236* (HAJB); Cafetales, 4 km al suroeste de El Culebro en la zona de Brazo Grande, *Bässler et al. 61015* (HAJB); Baracoa, *León & Victorín 17211* (HAC); Plants of cooper's ranch, bases of El Yunque mountains, Baracoa, *Underwood & Earle 1423, 517* (NY).—SANTIAGO DE CUBA: Sierra Maestra, Río Oro, at the edge of the river, *Ekman 7240* (NY, US); Pico Turquino, *Acuña 9989* (HAC); Loma del Gato, *Clemente 641* (HAC); Loma del Gato, *Clemente & Arsene 616* (HAC).—GUANTÁNAMO: Plants of Cooper's Ranch, base of El Yunque Mt., Baracoa, *Underwood & Earle 1423* (NY); prope villam Monte Verde dictam, *Wright 822* (GH, US). **Haiti.** Camp No. 1, Corail, *Nash & Taylor 1036* (NY); Port Margot to Correil, *Nash 212* (NY); Central Plain, Belldère, edge of Riv.[er] Jouan-de-Vire, *Ekman H 5635* (S); Massif du Nord, Vallière, slope of Morne Salnave, *Ekman H 9928* (S); Vicinity of St. Louis du Nord. Rocky slope mountain S of town Morne Chavary, *Leonard & Leonard 14538* (US).—CAHOS: Massif des Cahos, gr. "Las Caobas", Las caobas, Chap.[elle] Ste. Claire, *Ekman H 5540* (GH, US).—NORD: Ravine, Marmelade trail; vicinity of Plaisance, *Leonard 9376* (NY); Massif du Nord, Anse-à-Foleur, road to Hab. Colombo, *Ekman H 4371* (US).—OUEST: Massif de la Hotte, western group, Les Roseaux, Hab. Quillaud, *Ekman H 10121* (US).—SUD: Massif de la Hotte, western group, Camp Perrin, northern slope of Morne Vandervelde, in "Jardins Coutard", *Ekman H 102* (S). **Dominican Republic.** BARAHONA: Eastern edge of Sierra de Baoruco, 22.5 road km SW of Barahona, 9.4 km W of El Arroyo at Las Filipinas, *Mickel et al. 8973* (NY); In Bahoruco, 'Tierra llana', *Fuertes 910* (GH, US); Sierra de Baoruco: una loma (llamada El Manaclar en español), aprox. 1 km al Noroeste de Pae Mingo, *Zanoni et al. 25020* (NY).—DUARTE: Cordillera Septentrional, S. Francisco de Macorís, at Los Bracitos, *Ekman H 12297* (GH, US).—LA VEGA: Vicinity of Piedra Blanca. Deep shade along Maimón River, 1 mi. above bridge, *Allard 13818* (US).—PUERTO PLATA: Cordillera Septentrional, Puerto Plata, Loma Isabel de Torres, *Ekman H 14432* (NY, S). **Jamaica.** Above Moore Town, *Clute 257 a* (NY); Unknown locality, 1874, *Jenman s.n.* (NY); Above Cedar Valley, along the parochial road to Silver Hill Gap, *Maxon 10267* (GH, NY, US); Chapelton to Bull Head, *Underwood 3347* (NY); Hartford and adjoining properties, near Priestman's River, *Maxon 2529* (US); Hartford and adjoining properties, near Priestman's River, *Maxon 2532* (US); Hartford and adjoining properties, near Priestman's River, *Maxon 2531* (NY); Hermitage Dam and vicinity, *Maxon 8810* (NY, US); Hermitage Dam and vicinity, *Maxon 8796* (NY, US); Near Castleton, *Underwood 1989* (NY).—CLARENDON: 1mile northwest of Thompson town, *Proctor 6523* (IJ); Mason River Savanna, 2.75 miles due NW of Kellits P.O., *Proctor 26338* (IJ); Near Tweedside School, 2 miles ESE of Alston P.O., *Proctor 6775* (IJ); Summit of Bull head Mountain, *Proctor 36389* (IJ).—HANOVER: Dolphin Head, *Proctor 7157* (IJ).—PORTLAND: Pt. [Port] Antonio, 5 Jul 1891, *Metcalf s.n.* (US); Ca. 5 miles SW of Priestmans river, *Proctor 4265* (IJ); North slope of Pumkin Hill, ca. 3 miles southwest of Felloship P.O., *Proctor 5001* (IJ).—ST. ANDREW: Along Ginger River, 1.5 miles E.S.E. Brandon Hill, *Proctor 27808* (IJ); On open rocky bank beside the Moresham River, *Proctor 3908* (IJ).—ST. ANN: Ca. 1 mile south of Blackstonedge P.O., *Proctor 5078* (IJ).—ST. CATHERINE: Juan de Bolas district, W Point Hill, *Proctor 6973* (IJ); Vicinity of Hollymount, Mount Diablo, *Proctor 4059* (IJ).—ST. THOMAS: St. Thomas Pass, *Wilson s.n.* (US); 1/2 mile N of Bath Fountain along Sulfur River, *Wilson 572* (GH); Corn Puss Gap, *Wilson et al. 464* (GH, IJ); Corn Puss Gap, *Proctor 3982* (IJ);

Table 2 (cont'd)

A. balbisii var. ***balbisii*** cont'd

Mountain trail between House Hill and Cuna Cuna Gap, *Maxon 8967* (NY, US); Rowlands Field district, southeast slope of the John Crow Mountains, *Proctor 6416* (IJ).—TRELAWNY: Cockpit country, ca. 5 miles north of Quick Step, above Aberdeen P.O., *Proctor 4101* (IJ).—WESTMORELAND: 2 1/2 miles WNW of Hopewell, *Proctor 11216* (IJ); Copse mountain woods, c. 1 mile SW of Rat trap, *Proctor 21468* (GH, IJ); Mountain spring, 1.3 miles due NW of Lambs river, *Proctor 37757* (IJ). **Puerto Rico.** ADJUNTAS: On the Adjuntas road ten miles from Ponce, *Heller 6346* (HAC, US).—AIBONITO: Cañón de San Cristóbal, *Liogier et al. 31392* (NY).—ARECIBO: 18°20.86' N, 66°41.00' W. Bo. Río Arriba, on slopes of sinkhole midway along pilot road for proposed Rt 10, just E of Río Abajo Forest Reserve boundary, *Axelrod & Ward 8812* (NY); 18°20.86' N, 66°41.00' W. Bo. Río Arriba, Río Abajo Forest Reserve, bottom of sinkhole midway along pilot road (E side) for proposed Rt. 10, *Axelrod 8090* (NY).— BARRANQUITAS: Barranquitas, *Scamman 8119, 8121* (GH).—CAROLINA: Carolina District. 10 mi. SW of Carolina, 21 Apr 1944, *Wagner s.n.* (US).—GUAYAMA: Guayama Road, *Goll et al. 601* (US); Quebrada Arriba, Guayama Road, *Goll et al. 488* (US).—LUQUILLO: Sierra de Luquillo - El Yunque, *Sánchez & Liogier 75* (NY); El Yunque, km 10, Rd 191, 13 May 1967, *Woodbury s.n.* (NY); Luquillo Mountains, *Wilson 255* (US); Luquillo Mountains, *Wilson 62* (US).—MARICAO: Unknown locality, *Sintenis 410* (GH, US); Unknown locality, *Hioram 32* (US).—NAGUABO: Sierra de Naguabo. Loma Icaco, *Shafer 3409* (US).—OROCOVIS: Toro Negro Recreation Area, 4 Jan 1978, *Hickey & Tullis s.n.* (GH); Toro Negro Recreation Area, Growing along grassy roadside (not damp woods); area reached by following trail behind picnic tables to its top, 4 Jan 1978, *Hickey & Tullis s.n.* (GH); Toro Negro Recreation Area. Growing along trail-road side, fairly open area (not damp woods); area reached by following trail behind picnic tables to the top, 4 Jan 1978, *Tullis & Hickey s.n.* (GH).—PONCE: Bo. Guaraguao, along site of proposed Rt 10, S from jct Rts 303 & 305 to Río Portugues, *Axelrod et al. 8942* (NY).—RIO GRANDE: Sierra de Luquillo: Caribbean National Forest. Road 191, km 9.9 at Quebrada Juan Diego, *Proctor 39588* (US).—SAN JUAN: Río Piedras, *Hioram 227* (US); San Juan Mil. Rd, 14 mi SO, *Heller & Heller 676* (US).—UTUADO: Road from Utuado to Lares, *Underwood & Griggs 108* (US); Barrio Tetuán: upper NE. Slopes and summit of Cerro Morales, *Proctor 41342* (US).—VILLALBA: Vicinity of Alto de la Piedra above Villalba, *Britton & Earle 6089* (US). **Virgin Islands.** ST. CROIX: Unknown locality, *Fosberg & Hayes 55308* (US).—ST. THOMAS: Unknown locality, *Eggers 234* (US). **Saba.** (Dutch West Islands) The Mountain, under the cliffs, *Stoffers 4242* (US). **St. Kitts.** Lambert Estate, *Britton & Cowell 637* (US); Malyneaux Estate, *Britton & Cowell 312* (US); Wingfield Estate; fourth ravine, *Britton & Cowell 473* (US); Wingfield Ravine, *Box 371* (US). **Nevis.** Along track between Gingerland and Iron Gate, *Proctor 19446* (GH). **Montserrat.** Runaway Gut, near WOODLANDS, *Proctor 18873* (A, US). **Guadeloupe.** Saunt J'ean du [Matonba], Jan 1877, *Chiébaut s.n.* (US); Unknown locality, *Pére Duss 4056* (US); Matouba, *Scamman 8146* (GH); Trois-Riviere ([chenin du Trou-an Chien et habit. Tonchemberg]), *Pére Duss 4030* (US).—BASSE TERRE: Dolé, *Proctor 20123* (A, US). **Dominica.** Gorge in [Mt] Roseau, 11 Feb 1924, *Muëler s.n.* (US); Unknown locality, *Bailey 778* (US); Disturbed roadside trail near Bellevue on the road to Grand Bay, *Wilbur et al. 7672* (US); Highway between Pont Cassé and Rosalie, 1/4 mile E of junction with road to castle Bruce, *Chambers 2665* (NY, US); Lisdara, *Hodge 115* (NY); Soufriere, *Lloyd 543* (US).—ST. ANDREW: In ditch in banana plantation along side road above La Haut and 0.2 mi beyond Demitrie Ridge, *Lellinger 340* (US); Occasional on ground in coconut plantation at Concord Estate, W of the Pagua River, *Lellinger 488* (US).—ST. GEORGE: Trail from parking area to Trafalgar Falls, Trafalgar, *Hill & Phillippe 29035* (NY).—ST. JOSEPH: Near Riverdale Boxin

Table 2 (cont'd)

A. balbisii var. ***balbisii*** cont'd
Plant (bananas), near cave, ca. 0.5 km W of Bells. Near junction of Layou, Pagua, and Dleau Manioc Rivers, *Hill 23992* (NY).—ST. PATRICK: La Plaine, trail to Sari Sari Falls. *Hill 28060* (US). **Martinique.** Unknown locality, *Sieber 355* (GH); Above L. Alma, *Bailey & Bailey 277* (US); Beyond L. Alma, *Bailey & Bailey 234* (US); Morne Calebasse, N of Morne Rouge, *Proctor 21727* (GH); Porte forestier des Deux Choux, *Stehlé & Stehlé 3277* (US). **St. Lucia.** Barre de l'Isle, *Box 522* (US). **St. Vincent.** Au Chateau belair, *Eggers 6843* (US); Mt. St. Andrews, *Eggers 6807* (US). **Grenada.** ST. DAVID: Minorca Estate, above Windsor Forest, *Proctor 16902* (A, US). **Trinidad.** Unknown locality, *Fendler 22* (GH, US); St. Ann Ward, Loango, E fork of Maracas River, *Jermy 3084* (US); St. Ann Ward, Loango, E fork of Maracas River, *Jermy 3085* (US). **Tobago.** Forest by reservoir, *Hunnewell 19896* (GH); Great Dog River, *Eggers 5757* (US). **Mexico.** Unknown locality, *Orcutt 2977* (US).—OAXACA: Dist. Pochutla. Oaxaca-Pochutla road, 29.6 km NE of Pochutla, *Mickel 1301* (US). **Guatemala.** IZABAL: Puerto Barrios, *Kellerman 4864* (US). **Honduras.** ATLANTIDA: On the mountain slopes and coastal plains, vicinity of La Ceiba, *Yuncker et al. 8304* (GH, US). **Nicaragua.** CHONTALES: Near Santo Domingo, along small river a short distance from town, *Bunting & Licht 1156* (GH).—GRANADA: Volcan Mombacho, *Baker 2449* (MSC). **Panama.** San Jose Island, Perlas Archipelago, Gulf of Panama, (about 55 miles SSE of Balboa). Ravine below Pumpo, *Johnston 384* (GH). **Venezuela.** Island of Margarita. Juan Griego trail, *Johnson 190* (GH); Los Riítos, Aragua, *Williams 10511* (GH).—TERRITORIO DELTA AMACURO: Between La Palma and Moron. Rich rain forest Río Cuyubini, *Steyermark 87686* (US). **Ecuador.** Vicinity of Huigra, mostly on the Hacienda de Licay, *Rose & Rose 22608* (GH).

45b. ***Amauropelta balbisii*** var. ***longipilosa*** (C.Chr.) O. Alvarez — **Cuba.** PINAR DEL RÍO: El Valle de Ancón, near San Vicente, *Morton 9787* (US).—CIENFUEGOS: Above San Blas, *Morton 3980* (US).—SANCTI SPIRITUS: Buenos Aires, Trinidad Mountains, *Morton 10315, 10322* (US).—GRANMA: Sierra Maestra, Buey Arriba, Alto de La Gloria, cerca del poblado de Buey Arriba, *Zavaro et al. 68614* (HAJB).—HOLGUÍN: Frank País, falda norte de la Sierra Cristal, alrededor del arroyo en la subida a Palenque, Brazo Grande, *Bässler et al. 60558* (HAJB).—SANTIAGO DE CUBA: Gran Piedra, en sitios expuestos, cerca de cañadas, *Caluff & Shelton 3316* (HAC); Lado arriba de la Vía Mulata, márgenes del Río Barbudo, desde el terraplén de Jagüeyes hasta la casa de Rafael Navarro, 1992, *Caluff & Shelton s.n.* (HAJB).—GUANTÁNAMO: Cañadas entre Viento Frío y Limbano, lado arriba de la Vía Mulata, 17 Apr 1992, *Caluff & Shelton s.n.* (HAJB); Cooper's ranch, base of El Yunque Mt., Baracoa, *Underwood & Earle 517* (NY). **Haiti.** NORD: Marmelade trail, vicinity of Plaisance, *Leonard 9376* (GH, NY, US).—NORD-OUEST: Vicinity of St. Louis du Nord, *Leonard & Leonard 14369, 14254* (US); *Leonard & Leonard 14368* (GH, NY, US); Vicinity of Port de Paix, *Leonard & Leonard 12153* (US). **Dominican Republic.** BARAHONA: Sierra de Baoruco, 7.2 km from the Cabral-Palo road, on the road to Monteada Nueva, in areas called "El Gallo" and "Cortecito", *Mickel et al. 8046, 8055* (NY).—SAMANÁ: Old Heart River (Yato Viejo), Samaná Peninsula, *Abbott 1414* (US).—STO. DOMINGO: Cordillera Central. Arroyo Los Guananitos, *Ekman H11449* (NY, US); Cordillera Central. La Cumbre, *Ekman H11442* (US). **Jamaica.** CLARENDON: Chapelton to Bull Head, *Underwood 3354* (NY).—PORTLAND: Port Antonio, 7 May 1891, *Metcalf s.n.* (US); Swift River, near Hope Bay, 11 Jun 1904, *Moore s.n.* (US); Seamen's Valley, *Maxon & Killip 34* (GH, NY, US); East slope of the John Crow Mountains, ca. 1 mile southwest of Ecclesdown, *Proctor 5663* (IJ).—ST. ANDREW: Vicinity of Castleton, edge of river, *Maxon 835* (US).—ST. JAMES: Near Mocho, above Catadupa, *Maxon & Killip 1533* (GH, US).—ST. MARY: Along lower

Table 2 (cont'd)

A. balbisii var. *longipilosa* cont'd
course of the Ugly river, *Proctor 5369* (IJ).—ST. THOMAS: Mountain trail between House Hill and Cuna Cuna Gap, *Maxon 8956* (GH, NY, US); In gorge of the Plantain Garden River, 1 1/2 miles N.N.W. of Whitehall, *Proctor 4615* (IJ); Along trail south from Corn Puss Gap toward Bath, *Proctor 3902* (IJ).—TRELAWNY: Windsor, *Miller 1465* (US). **Puerto Rico.** ADJUNTAS: Monte Cerrote, near Adjuntas, *Britton & Brown 5388* (US); On the Adjuntas road, eight miles from Ponce, *Heller 6137* (HAC, US); Road from Ponce to Adjuntas, *Underwood & Griggs 764* (US).—CIALES: Barrio Toro Negro: Road 144, km 14.2, *Proctor & Pinto 40564* (NY, US).—JAYUYA: Near Mt. Jayuya, 2 Jan 1978, *Tullis s.n.* (GH).—LAS MARÍAS: La Juanita, near Las Marías, *Britton et al. 3936* (US); Barrio Espino: 1.1 km due NW of intersection of Roads 124 and 431, *Proctor & Padrón 40848* (US).—LUQUILLO: Slopes of El Yunque, 23 Apr 1944, *Wagner s.n.* (US).—NAGUABO: Sierra de Naguabo, Barrio de Maizales, *Britton & Shafer 2129* (US); Sierra de Luquillo: Caribbean National Forest. Along Road 191 near entrance to El Toro trail, *Proctor 41127* (US).—YAUCO: Rubias, N of Yauco, *Britton & Britton 7360* (US). **Virgin Islands.** ST. THOMAS: Ineligible locality, *Eggers 32* (US). **St. Kitts.** Molyneux Water Source, *Proctor 19291* (A). **Dominica.** Woodlands about South Chiltern Estate, *Hodge & Hodge 1598* (GH).—ST. PAUL: Sylvania Estate, along trail to Middleham Falls to E from Imperial Highway, 15°21'30" N, 61°21'50" W, *Hill 25684* (US). **Martinique.** Piroque au Lorrain, *Stehlé 6729* (US). **St. Lucia.** Quilesse, *Beard 1040* (US); Barre de L'Isle, *Proctor 17569* (GH). **St. Vincent.** ST. DAVID: Along Chateabelair River, *Morton 5224* (GH, US). **Grenada.** Unknown locality, 1891, *Sherring s.n.* (US). **Mexico.** OAXACA: Vicinity of Cafetal Concordia, *Morton & Makrinius 2543* (US). **Honduras.** Tela river above Lancetilla, *Steeves & Ray 409* (GH). **Nicaragua.** MANAGUA: Sierra de Managua, Río Las Nubes, *Garnier 1429* (GH). **Costa Rica.** CARTAGO: Turrialba, near the Interamerican Institute, *Scamman 7662* (GH). **Panama.** PANAMA: Vicinity of Río Pacora, E of Panama City on Panama National Highway, *Bartlett & Lasser 16963* (GH). **Colombia.** ANTIOQUIA: Carretera al mar en los alrededores del Río Ampurrumiadó, *Gutierrez & Barkley 17C 195* (GH). **Ecuador.** GALAPAGOS: Miconia belt near Media Luna, *van der Werff 965* (A); Santa Cruz, *Wiggins 18606* (US); Isla Santa Cruz. Between Horneman's Ranch and Fern-Sedge Zone, along trail to Mt. Crocker, *Wiggins 18606, 18542* (US). **Peru.** HUANUCO: Prov. Huanuco. Tingo María, Valley of Río Huallaga, *Belshaw 3066* (GH).

46. ***Amauropelta opposita*** (Vahl) Pic. Serm. — **Puerto Rico.** ADJUNTAS: in monte ?Cedro? in ? praeruptis?, *Sintenis 3977* (A, NY, US, MSC).—CAYEY: Road from Guayama to Cayey, *Underwood & Griggs 432* (US). **Montserrat.** Along trail E of Soufriere, *Shafer 722* (US). **Guadeloupe.** BASSE TERRE: Vicinity of Matouba, *Proctor 20402* (A, US); Plateau du Palmiste, NE of Gourbeyre, *Proctor 20139* (A, MICH, US). **Dominica.** Morne Anglais, *Hodge 128* (US); In river gravels bordering Pegoua River, in vicinity of Deux Branches, Concorde Valley, *Hodge & Hodge 3452* (GH); Rainforest borders between Laudat and Freshwater Lake, *Hodge & Hodge 1760* (GH); Laudat, *Lloyd 26* (NY).—ST. ANDREW: Along roadside near Deux Branches, *Lellinger 381* (US).—ST. GEORGE: Along stream near road to Fresh Water Lake beyond Laudat, *Lellinger 553* (US); Forested slopes of Micotrin, along trail from a point about 1/2 mi beyond Laudat to one about 1/2 mi beyond Fresh Water Lake (L'etang), *Wilbur et al. 7444* (MICH, US).—ST. JOSEPH: On road cut S of Tiperie, N side of Morne Couronne, *Lellinger 505* (MICH).—ST. PAUL: Sylvania Estate, *Hodge 129* (US); Sylvania, *Proctor 114* (GH, NY, US). **Martinique.** Route du Bourg du Gros Morne au Calvaire, Camp Colson, *Pére Duss 4615* (NY); Morne Calebasse, N of Morne Rouge, *Proctor 21729* (GH, US); Camp Colson,

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Table 2 (cont'd)

A. opposita cont'd
Stehlé & Stehlé 3418 (US); Valleé du Lorrain aux Deux Choux, *Stehlé & Stehlé 3339* (US). **St. Lucia.** Savanne Edmund district, SE of Piton Troumassée, *Proctor 17641* (US); *17649* (GH). **St. Vincent.** Calvary, *Eggers 6732* (US); Upper valley of Richmond River, *Morton 6285* (GH, US).–-CHARLOTTE: Along the road to Farm, *Cooley 8589* (A, NY).—ST. ANDREW: Lowrt W slope of Grand Bonhomme Mountain, *Cooley 8391* (A, NY).—ST. DAVID: Along Chateaubelair River, *Morton 5190* (MICH, NY, US). **Grenada.** Black Forest, near Soulier, *Broadway 4722* (US).—ST. JOHN: Mount Felix, *Eggers 6036* (US).—ST. MARK: Tufton Hall Estate, *Proctor 17157* (A, MICH, US). **Trinidad.** Blanchisseuse Road near 8 1/2 mile post, *Broadway 5865, 5997* (US); Unknown locality, 17 Jul 1985, *Knobloch s.n.* (MSC); Unknown locality, *Fendler 65* (GH, US). **Tobago.** [Cremorne] River, *Eggers 5850* (US). **Honduras.** COMAYAGUA: Río Selguapa, *Rodriguez 2542* (GH). **Nicaragua.** NUEVA SEGOVIA: Shaded streamside on S slope of Mogoton, *Atwood & Neill 13* (MSC). **Costa Rica.** CARTAGO: Juan Viñas, Gebiet d. Rio Chis, *Brade & Brade 592* (GH); On the road from San José to Turrialba, 7 km E of Juan Viñas, *Mickel 2604* (US); Tapantí, ca. 15 km S of Paraíso, *Mickel 2329, 2330* (US); Rio Turrialba, *Smith 5087* (US).—SAN JOSÉ: Vicinity of El General, *Skutch 4381* (GH, US); *Skutch 4249* (US). **Panama.** COCLÉ: 3 mi NE of Antón, *D'Arcy & Croat 4115* (NY). **Colombia.** AMAZONAS: Río Amazonas: 2 km downriver from Puerto Nariño, *Plowman et al. 2410 a* (GH).—MAGDALENA: Mountains above Santa Marta, *Foster et al. 1294* (A).—META: Sabanas de San Juan de Arama, margen izquierdo del Río Güejar, alrededores del aterrizaje "Los Micos", *Idrobo & Schultes 575* (GH). **Brazil.** Santa Catarina, Joinville, *Müller 76* (A).—ESPÍRITO SANTO: Near Santa Barbara de Caparaó, *Mexia 4006* (GH).—GOIÁS: Contraforte Central. Gallery forest and adjoining cerrado, ca. 24 km NE of Catalao, *Irwin et al. 25373* (MICH).—MINAS GERAES: Viçosa. Agricultural College land. Flood plain behind Director's house, *Mexia 4852* (GH).—RIO DE JANEIRO: Vicinity of Meio da Serra, 22°33' S, 43°11' W, *Smith & Brade 2282* (GH). **Ecuador.** NAPO: Cantón Tena. Jatun Sacha Biological Station. 8 km E of Misahualli, 1°04' S, 77°36' W, *Fay & Fay 2728* (MICH); Puerto Napo rainforest, 3 km E of Puerto Napo, 1°02' S, 77°46' W, *Holm-Nielsen & Jeppesen 719* (GH).—NAPO-PASTAZA: Near Tena, *Mexia 7139* (GH). **Peru.** CUZCO: Prov. Paucartambo. Atalaya, hillside and riverbank near junction Rio Carbon with Rio Alto Madre de Dios, *Foster et al. 3005* (GH).—LORETO: Prov. Maynas. Rio Itaya ca. 10 km S of Iquitos, *Tryon & Tryon 5196* (GH); Prov. Maynas. Rio Itaya ca. 10 km S of Iquitos, *Tryon & Tryon 5174* (GH).—SAN MARTÍN: Prov. San Martín. Dpto. Tarapoto. Carretera Tarapoto-Yurimaguas, km 12-15, *Hickok 638* (GH). **Bolivia:** COCHABAMBA: Antuhuacana, Tal des Espíritu Santo Flusses [et voa] 160 km nordöstlich von Cochabamba, *Buchtien 7* (GH); Puerto Polonia on the Rio Coni, 14 km E of San Antonio, *Cardenas & Cutler 7321 B* (GH); Prov. Chapare. San Rafael, *Steinbach 481* (GH).

47. *Amauropelta resinifera* (Desv.) Pic. Serm. — **Cuba.** PINAR DEL RÍO: Minas de Matahambre, arroyo del Alcalde, *Roig 8396* (HAC); San Diego de los Baños, *León 4242* (HAC); Minas de Matahambre, márgenes de arroyo Sumidero, *Sánchez et al. 51495* (HAJB); Guane, Guillén, lomas Cantadoras, *Alvarez et al. 54402* (HAJB); Limestone hills, vicinity of Sumidero, *Shafer & Leon 13649* (NY); Source of Río Taco-Taco, Sierra de los Organos, *Morton 4338* (US); Mountains near El Guama, *Palmer & Riley 137, 158* (US); From Galalón to San Pedro del Caimito, *Shafer 11938* (A); Arroyo del Sumidero, *Shafer & Leon 13563* (A).—CIENFUEGOS: Escambray, orillas de un arroyo cerca de Buenos Aires, *Bisse 23251* (HAJB); Las Vegas de Matagua, Buenos Aires, *Jack 6479* (GH).—SANCTI SPIRITUS: Vicinity of Sancti Spiritus, N of town into low dry hills, *Shafer 12136* (A, MICH, US); Lomas de Banao, *León 1562* (HAC);

Table 2 (cont'd)

A. resinifera cont'd Banao, camino entre el monumento de Cantú y tope de la Diana, *Arias et al. 59755* (HAJB), *59829* (HAJB).—GRANMA: Buey Arriba, alrededores del poblado de Barrio Nuevo, *Alvarez et al. 63085, 63853, 63854, 64162, 64660* (HAJB); Buey Arriba, alto del Escudero, *Alvarez et al. 64800, 64801* (HAJB); Buey Arriba, Pico Verde, *Alvarez et al. 64967* (HAJB); Along Río Peladero, below Aserradero San Antonio de las Cumbres, crest of Sierra Maestra, *Morton 9503, 9522* (US); Along Río Buey, N slope of Sierra Maestra, *Morton & Acuña 3822* (US).—HOLGUÍN: orillas del arroyo Guayabo, Sierra de Nipe, *León & Victorín 17211* (HAC).—SANTIAGO DE CUBA: Camino a la Gran Piedra, *Clemente 6572* (HAC); a lo largo del río Buey, *Morton & Acuña 12039* (HAC); Loma del Gato, orillas del afluente del Tamboril, *Leon et al. 10219* (HAC), *9912* (HAC); Loma del Gato, *Clemente 1299, 412* (HAC); Sierra del Cobre, *Hioram 9363, 9379* (HAC); Falda sur de Sierra Cristal, cabezadas del arroyo Cristal, *Caluff 58630* (HAJB); Segundo Frente, camino entre el Halcón y las cabezadas de río Levisa, al sur de Pico Cristal, *Alvarez et al. 56557* (HAJB); Gran Piedra, río de La Reserva, Isabelica norte, *Sánchez et al. 71313* (HAJB); Gran Piedra, cañada debajo del centro turístico, ladera sur, *Sánchez et al. 71372* (HAJB); Cerca de la Gran Piedra, *Clement 7562* (US); Sierra Maestra, El Cobre, Loma del Gato, *Clement 1696* (US); Loma del Gato and vicinity, Sierra Maestra, *Hioram & Clement 6459* (US); Loma del Gato and vicinity, Cobre range of Sierra Maestra, *Leon et al. 9912* (HAC, US); Valley of the Río Bayamita, S slope of the Sierra Maestra, *Maxon 3964* (US).—GUANTÁNAMO: Imías, las calderas alrededor del pueblo, *Bisse et al. 46999* (HAJB); Cuba Orientali, 1856-7, *Wright 820* (GH).—ISLA DE LA JUVENTUD: Arroyo 2 Km del Cerro Mal País, *Bisse 1668* (HAJB); Nueva Gerona, Sierra Cañada, *Bisse 738* (HAJB); Finca Mamey, headwaters of Río Las Casas, *Killip 44680* (HAC, US); Howard Estate, along Río Callejón, *Killip 43797* (HAC, US); S of Santa Bárbara, *Killip 43091* (HAC, US); Santa Fé, *Killip 43049* (HAC, US). **Haiti.** ARIBONITE: Ravine NW of Marmelade, *Nash & Taylor 1370* (NY).—NORD: Plaisance, *Nash 867* (NY).—SUD: Massif de la Hotte; eastern group, Pt. Goave, at Bellevue, *Ekman H6610* (US). **Dominican Republic.** LA VEGA: Vicinity of Jarabacoa. On bank at Jimenoa Falls, *Allard 14843* (US); Vicinity of Piedra Blanca. At base of cliffs near water along stream near rancho, I mile above Maimon River bridge, *Allard 13802* (US); Vicinity of Piedra Blanca. On ledge, banks of stream near rancho, 1 mile above Maimon River bridge, *Allard 13800* (US); Vicinity of Piedra Blanca. Ledge on bank of stream, Maimon River, one mile above bridge, *Allard 13799* (US); Cordillera Central: Jarabacoa, toward Buenavista, *Ekman H14194* (US); Santo Domingo; Cordillera Central, Jarabacoa, in swamp at Pinar Quemados, *Ekman H14145* (NY); Jarabacoa, *Fuertes 1800* (GH, NY, US); Between Constanza and Jarabacoa, *Jones & Norris 1065* (NY).—MONTE CRISTI: Cordillera Central: Manción, at the junction of Río Cenobí and Río Cenobicito, edge of water (of stream), *Ekman H12934* (US); Cordillera Central: Manción Lagunas de Cenobí at Río Cenobicito, *Ekman 12962* (US).—SAN CRISTOBAL: San Cristobal-Peravia border: Cordillera Central, along Río Mahoma, 5.3 km E of Piedra Blanca-Rancho Arriba road, (from point 19 km SW of Piedra Blanca, 11.2 km NE of Rancho Arriba, 0.7 km NE of La Penita), *Mickel et al. 9060, 9099* (NY).—SAN JOSÉ DE OCOA: El Torito Yuna, Rancho Arriba. A orillas del río Yuna, *Liogier & Liogier 26053* (NY).—SANTIAGO: Distr. S. José, Arr. Mata Puerco, Jicome, *Valeur 996* (NY); Distr. of San José de las Matas, Jicomé, *Valeur 990* (US); Distr. of San Josė de la Matas, Jicomé, *Valeur 198* (NY).—SANTIAGO-RODRIGUEZ: north side of Cordillera Central, Arroyo Caña, 27 km SW of Cepillo part of Monción, 1 km past pueblo of Aguacate, *Mickel et al. 8615* (NY). **Jamaica.** PORTLAND: Upper Swift River, study site of Ecological Survey, Blue Mt. Multipurpose Project near Mossman's Peak, *Bretting J-261* (NY); Seamen's Valley, *Maxon & Killip 34 a* (US); Vicinity of

Table 2 (cont'd)

A. resinifera cont'd
Thomsons Gap, *Maxon & Killip 750* (GH, US); Vicinity of Mill Bank, *Maxon & Killip 147* (GH, US); Near Green Hills Guest House, c. 1 mile ENE of Hardwar Gap, *Proctor 10317* (A); Northern side of Blue Mountains, Hardwar Gap and vicinity (Newcastle to Buff Bay road), ca 3/4 mile (air) S of Green Hill, *Tryon et al. 6971* (GH).—ST. ANDREW: Above Cedar Valley, along the parochial road to Silver Hill Gap, *Maxon 10287* (GH, US); Mount James and vicinity, *Maxon 8613* (GH); Near Hardwar Gap, *Maxon 1107* (US); Second Breakfast Spring, near Tweedside, *Maxon 1000* (US); Vicinity of Castleton; along the Ginger River, *Maxon 828* (US); Vicinity of Castleton; bank of the Ginger River, *Maxon 821* (US); Near Charlottenburg [house], *Maxon & Killip 1419* (GH, US); Vicinity of Cinchona, Old England, *Underwood 3227, 3236* (US).—ST. CATHERINE: Between Point Hill and Juan de Bolas, *Yuncker 18378* (MICH, NY).—ST. MARY: Near Castleton, on the road to Annatto Bay; banks of Ugly River near junction with Wog Water, *Maxon 802* (US).—ST. THOMAS: Near Cuna-Cuna Pass, *Maxon 1737, 1743, 1746, 1757* (US); Cuna-Cuna trail, above Mattis River, *Maxon & Killip 181* (GH, US); Blue Mountains, 1-2 miles SE of Cuna-Cuna Pass, *Wilson & Murray 641* (A, MICH, US).—TRELAWNY: Litchfield district, 0.5 miles E of Wait-a-Bit, *Proctor 21377* (GH, MICH).—WESTMORELAND: Mount Airy, *Maxon 855* (US). **Puerto Rico.** ADJUNTAS: Mt. Guilarte, *Liogier et al. 30315* (NY); Barrio Guilarte: By junction of Road 131 & Road 518, *Proctor & Estremera 39941, 39942* (US).—AIBONITO: Município de Aibonito. Barrio Llanos: Upper end (access from SE) of Cañon de San Cristobal, *Proctor & Pinto 40637* (NY).—CAROLINA: 8 miles SW of Carolina, 13 Mar 1944, *Wagner s.n.* (US).—CAYEY: Morillos, *Sintenis 2281* (GH, US).—JAYUYA: Cordillera Central: Barrio Saliente. On open mountain slope c. 1.5 km due slightly N of W from Cerro Rosa, *Proctor et al. 43968* (US).—NAGUABO: Bo. Río Blanco, Caribbean National Forest, along 1.5 km stretch up Río Sabana S of closed portion of Rt 191, *Axelrod & Chavez 4138* (NY).—RIO GRANDE: Sierra de Luquillo: Caribbean National Forest. Above El Verde, near Estación Fluviométrica along Río Espíritu Santo, *Proctor 39489* (US). **U.S.A.** FLORIDA: Polk Co. Along Peace Creek, near Fort Meade, *Correll 6287* (US); Polk Co. Near bridge near Peace River, E of Fort Meade, *Maxon 10850* (US); Polk Co. Along Peace River, Fort Meade, *McFarlin 4190* (MICH); Pasco Co. Approx. 2 mi W of Dade City on state road # 52, 30 Nov 1957, *Darling s.n.* (US); Pasco Co. 1 mile S of Lake Jovita, *O'Neill 7589* (GH, HAC, MICH, NY, US); Pasco Co. St. Leo, *O'Neill 1059* (US). **Mexico.** JALISCO: Wet banks near Guadalajara, *Pringle 11794* (GH).—MEXICO: District of Temascaltepec, *Hinton 4966* (GH).—OAXACA: Distrito Choapan. Yaveo; Arroyo San Pedro, *Mexia 9203* (GH); District of Villa Alta, valley of the Yelagago River, ca. 20 mi NE of Villa Alta, 17°25' N, 96°05' W, *Mickel 1067, 1068* (MSC).—VERACRUZ: About 8 km S of Misantla, *Conant 795* (GH); 6 km S of Huatusco, *Riba et al. 393* (GH). **Guatemala.** BAJA VERAPAZ: Meadows in valleys along National route 5, about 14 mi S of Coban, *King 3298* (US).—CHIMALTENANGO: Along Río Guacalate, SE of Chimaltenango, *Standley 80005* (US).—IZABAL: S shore of Lago Izabal, W of village of Izabal, *Jones et al. 3055* (US).—SAN MARCOS: Mountains 5 mi W of Malacatan, *Grant 567* (GH).—SUCHITEPÉQUEZ: Chocola, *Brenckle 87* (US).—ZACAPA: Sierra de las Minas; trail between Río Hondo and waterfall, *Steyermark 29466* (GH). **El Salvador.** LA LIBERTAD: Los Chorros, *Porter 1266* (GH).—SAN SALVADOR: Vicinity of Ayutuxtepeque, *Standley 20516* (GH). **Honduras.** EL PARAÍSO: Road along San Cristobal river, Danlí, *Carlson 2586* (GH).—MORAZÁN: El Jicarito, above El Zamorano, thickets and low forest near Río Caparrosa, *Standley 16332* (GH). **Nicaragua.** NUEVA SEGOVIA: About 2 km N of Dipilto and 1 km W of main road beside stream, *Atwood & Neill AN 8* (MSC).—RAAN: Comarca del Cabo, Thaeler

A. resinifera cont'd
Memorial Hospital, Bilwaskarma, *Atwood 4620* (GH). **Costa Rica.** CARTAGO: Turrialba, near Interamerican Institute, *Scamman 7103* (GH); Dulce Nombre, *Stork 2942* (GH). **Panama.** CHIRIQUÍ: 1.4 mi S of Cerro Punta, *Graham 291* (GH); Vicinity of El Boquete, *Maxon 5148* (GH).—PANAMA: 30 mi NW David (El Hato), *Sharp 26* (MSC).

49. ***Amauropelta malangae*** (C.Chr.) O. Alvarez — **Cuba.** GRANMA: La Bayamesa. Cañada tributaria al río El Manguito, antes del salto, *Caluff 5791 A* (BSC).—SANTIAGO DE CUBA: Sierra Maestra, Loma del Gato, *Clement 1263* (US); Sierra Maestra, Arroyo Jiménez, *Ekman 14819* (US). **Dominican Republic.** AZUA: Sierra de Ocoa, San José de Ocoa, Loma del Rancho, *Ekman H11625* (NY).—LA VEGA: en ?ladera?, en bosque a lo largo del Río Tablones, Ciénega de Manabao, Jarabacoa, *Liogier & Liogier 23553* (NY); Cordillera Central: en las orillas del Arroyo La Sal, aprox. 1 km arriba (este) del poblado rural de La Sal; con cafetales, entre Loma La Sal y Loma La Golondrina, 19°04' N, 70°34' O, *Zanoni et al. 19963*, *19959* (NY); Cordillera Central: base Norte y subida de Loma el Campanario (=Pico de Piedra en el mapa), 4 aero-kilómetros W de La Culata de Constanza, un valle entre dos lomas; ladera de El Campanario, 18°57.5' N, 70°48' O, *Zanoni et al. 27552* (NY).—MONTE CRISTI: Cordillera Central. Manción, Río Cenobicito, *Ekman H12962* (US).—PERAVIA: Cordillera Central: 20 km NW of Rancho Arriba, crossing Río Nizao twice, to end of road, 7.8 km after second river crossing, at Quita Pena; 1.5 hr walk N of Quita Pena to nearest forest, *Mickel et al. 9129* (NY); Cordillera Central. Lado N de la Loma de la Valvacoa, arriba del poblado rural El Guineal, 18°28' N, 70°22' O, *Zanoni et al. 21612* (JBSD).—SAN CRISTOBAL-PERAVIA: San Cristobal-Peravia border: Cordillera Central, along Río Mahoma, 5.3 km E of Piedra Blanca-Rancho Arriba road, (from point 19 km SW of Piedra Blanca, 11.2 km NE of Rancho Arriba, 0.7 km NE of La Penita), *Mickel et al. 9086* (NY); Prov. Peravia-Prov. San Cristobal limite: Cordillera Central: Mahoma 12 km noreste de Rancho Arriba (en la carretera a Piedra Blanca) y 4 km sur hasta Mahoma y Río Mahoma, 18°43.5' N, 70°22' O, *Zanoni et al. 22568* (NY). **Jamaica.** ST. ANDREW: Second Breakfast Spring, near Tweedside, *Underwood 2131* (NY).

50. ***Amauropelta pachyrachis*** (Kunze ex Mett.) O. Alvarez — **Cuba.** GRANMA: La Bayamesa. Arroyo La Nigua, Barrio Nuevo, *Caluff 5876* (BSC); Southern side of the crest of the Sierra Maestra W of Aserradero San Antonio de las Cumbres, region of La Bayamesa, *Morton 9642* (US). **Haiti.** OUEST: Massif des Cahos, group Las Caobas, Belladére, Morne Lagoune-Ibére, *Ekman H5609* (US); Vicinity of Furcy, Morne de Weyan, *Leonard 4713*, *4769* (US).—SUD: Massif de la Hotte, western group, Les Roseaux, Morne Gillet near Sablier, *Ekman H10182* (US).—SUD-EST: Massif de la Selle, Pétionville, Morne Brouet, *Ekman H10042* (US). **Dominican Republic.** AZUA: Sierra de Ocoa. San José de Ocoa, Bejucal, *Ekman H11806* (US). **Jamaica.** PORTLAND: Summit of Blue Mountain Peak, *Maxon 1422* (US); *9898*, *9919* (GH, US); 1/2 miles N of Hardwar Gap, Port Royal Mountains, *Proctor 6833*, *7830* (IJ); Blue Mountain Peak: N slope of summit area, *Proctor 4304* (IJ); Summit of Blue Mountain Peak, *Underwood 2529* (NY); Blue Mountain Peak, *Underwood 1496* (US).—ST. ANDREW: Vicinity of Morce's Gap, *Maxon 2769* (US).—ST. THOMAS: Blue Mountain peak: summit area, *Proctor 5433* (IJ); Summit of Blue Mountain peak, *Proctor 28554* (IJ).

APPENDIX C

Qualitative and quantitative morphological characters used in the study of Caribbean amauropeltoid ferns

Table 3. Morphological characters and character states used in the study of Caribbean amauropeltoid ferns: Qualitative characters.

RHIZOMES: **1) habit:** (0) erect (suberect included), (1) creeping (short- or long-creeping); **2) mucilagenous coverage:** (0) absent, (1) present.

RHIZOME INDUMENT: **3) scales at apex:** (0) absent, (1) present; **4) scales distribution:** (0) scattered, (1) in mass; **5) scales color:** (0) light-brown, (1) castaneous, (2) golden-brown; **6) scales sheen:** (0) lustrous, (1) matte; **7) scales shape:** (0) linear-lanceolate, (1) ovate, (2) ovate-lanceolate, (3) lanceolate-acuminate, (4) other shape; **8) scales clathrateness:** (0) uniformly colored, (1) subclathrate, (2) clathrate throughout; **9) scales indumenta:** (0) glabrous, (1) hairy only, (2) hairy and glandular, (3) glandular only; **10) scales hair density:** (0) sparse, (1) dense.

LEAVES: **11) fertile-sterile leaf differentiation:** (0) monomorphic, (1) slightly dimorphic; **12) main axis sulcation:** (0) monosulcate, (1) bisulcate, trisulcate, or tetrasulcate; **13) growth types:** (0) in fascicles, (1) leaves growing distant to one another.

LEAF INDUMENT (in reference to glands only): **14) glands on laminae, costae, costules, veins, and/or indusial abaxially:** (0) absent, (1) present; **15) gland types:** (0) globular, sessile, (1) globular, stalked, (2) hairlike (capitate); **16) glands color:** (0) reddish, (1) yellowish, (2) hyaline; **17) glands density on laminar surface:** (0) sparse, (1) dense.

PETIOLES: **18) color proximally:** (0) dark-brownish, (1) blackish; **19) color distally (including rachis):** (0) stramineous, (1) light-brownish to olivaceous, (2) atropurpureous; **20) indumenta (in reference to hairs):** (0) absent, (1) present; **21) hair types:** (0) acicular, unicellular, (1) acicular, multicellular, (2) uncinate, (3) fasciculate; **22) acicular hairs:** (0) all more or less uniform in length, (1) obvious distinction between short and long hairs in the same individual; **23) hair density:** (0) sparse or hairy on adaxial sulcus only, (1) relatively dense on both sides; **24) hair orientation:** (0) patent, (1) somewhat appressed, (2) fully antrorsely appressed, (3) fully retrorsely appressed; **25) indumenta (in reference to scales):** (0) absent, (1) present; **26) scales density:** (0) sparse, (1) dense; **27) scales color:** (0) light-brown, (1) castaneous, (2) golden-brown; **28) scales sheen:** (0) lustrous, (1) matte; **29) scales shape:** (0) linear-lanceolate, (1) ovate, (2) ovate-lanceolate, (3) lanceolate-acuminate, (4) other shape; **30) scales clathrateness:** (0) uniformly colored, (1) subclathrate, (2) clathrate throughout; **31) scales indumenta:** (0) glabrous, (1) hairy only, (2) hairy and glandular, (3) glandular only; **32) scales hair density:** (0) sparse, (1) dense.

RACHISES: **33) indumenta (in reference to hairs):** (0) absent, (1) present; **34) hair types:** (0) acicular, unicellular, (1) acicular, multicellular, (2) uncinate, (3) fasciculate; **35) acicular hairs:** (0) all more or less uniform in length, (1) obvious distinction between short and long hairs in the same individual; **36) hair density:** (0) sparsely or hairy on adaxial sulcus only, (1) relatively dense on both sides; **37) hair orientation:** (0) patent, (1) antrorsely appressed, (2) retrorsely appressed; **38) indumenta (in reference to scales):** (0) absent, (1) present; **39) scales density:** (0) sparse, (1) dense; **40) scales color:** (0) light-brown, (1) castaneous, (2) golden-brown; **41) scales sheen:** (0) lustrous, (1) matte; **42) scales shape:** (0) linear-lanceolate, (1) ovate, (2) ovate-lanceolate, (3) lanceolate-acuminate, (4) other shape; **43) scales clathrateness:** (0) uniformly colored, (1) subclathrate, (2) clathrate throughout; **44) scales indumenta:** (0) glabrous, (1) hairy only, (2) hairy and glandular, (3) glandular only; **45) scales hair density:** (0) sparse, (1) dense.

Table 3 (cont'd)

LAMINAE: **46) termination:** (0) determinate, (1) indeterminate, apices still uncoiling; **47) dissection:** (0) 1-pinnate, (1) pinnate-pinnatifid, (2) 2-pinnate-pinnatifid; **48) laminar texture:** (0) thin, herbaceous, (1) thick, coriaceous; **49) shape:** (0) linear, (1) lanceolate, (2) lanceolate-acuminate, (3) oblong, (4) oblong-lanceolate, (5) deltate-lanceolate; **50) apices:** (0) acuminate, (1) attenuate; **51) proximal pinnae reduced (at least one pair):** (0) no, (1) yes; **52) proximal reduced pinnae shape:** (0) oblong-pinnatifid, (1) trilobate, (2) deltate-pinnatifid, (3) other shapes; **53) abaxial laminar tissue indumenta (in reference to hairs):** (0) glabrous, (1) pubescent; **54) abaxial hair types:** (0) acicular, unicellular, (1) acicular, multicellular, (2) uncinate, (3) fasciculate; **55) abaxial acicular hairs:** (0) all more or less uniform in length, (1) obvious distinction between short and long hairs in the same individual; **56) abaxial hair density:** (0) sparse, (1) relatively dense on both sides; **57) abaxial hair orientation:** (0) patent, (1) antrorsely appressed, (2) retrorsely appressed; **58) adaxial laminar tissue indumenta (in reference to hairs):** (0) glabrous, (1) pubescent; **59) adaxial hair types:** (0) acicular, unicellular, (1) acicular, multicellular, (2) uncinate, (3) fasciculate; **60) adaxial acicular hairs:** (0) all more or less uniform in length, (1) obvious distinction between short and long hairs in the same individual; **61) adaxial hair density:** (0) sparse, (1) relatively dense on both sides; **62) adaxial hair orientation:** (0) patent, (1) antrorsely appressed, (2) retrorsely appressed; **63) aerophores at pinna bases:** (0) absent, (1) present; **64) aerophores shape:** (0) short, clavate, (1) elongate, deltate, (2) aerophores other shape; **65) proliferous bulbils at bases of some distal pinnae:** (0) absent, (1) present; **66) proliferous bulbils indumenta:** (0) glabrous, (1) covered by uncinate hairs, (2) covered by scales.

PINNAE: **67) articulation:** (0) sessile, (1) subpetiolate; **68) disposition on laminae:** (0) opposite, (1) subopposite, (2) alternate; **69) shape:** (0) linear, (1) lanceolate, (2) oblong-lanceolate, (3) deltate-lanceolate; **70) apices:** (0) acuminate, (1) attenuate; **71) sinuses:** (0) shallow, (1) medium, (2) deep; **72) pinnae (longest) with at least one pair of free basal segments:** (0) no, (1) yes; **73) pinna (medial) basal segments elongate:** (0) no, (1) yes; **74) pinna (medial) basal segments auriculate:** (0) no, (1) yes; **75) pinna basal segments often overlapping those of adjacent pinnae:** (0) no, (1) yes; **76) pinna basal segments often overlapping the rachis:** (0) no, (1) yes; **77) segment margins:** (0) entire, (1) revolute, (2) crenate; **78) segments shape:** (0) oblong, (1) deltate, (2) falcate; **79) segment apices shape:** (0) round, (1) acute, (2) cuspidate.

COSTAE: **80) abaxial indumenta (in reference to hairs):** (0) glabrous, (1) pubescent; **81) abaxial hair types:** (0) acicular, unicellular, (1) acicular, multicellular, (2) uncinate, (3) fasciculate; **82) abaxial acicular hairs:** (0) all more or less uniform in length, (1) obvious distinction between short and long hairs in the same individual; **83) abaxial hair density:** (0) sparse, (1) relatively dense on both sides; **84) abaxial hair orientation:** (0) patent, (1) antrorsely appressed, (2) retrorsely appressed; **85) adaxial indumenta (in reference to hairs):** (0) glabrous, (1) pubescent; **86) adaxial hair types:** (0) acicular, unicellular, (1) acicular, multicellular, (2) uncinate, (3) fasciculate; **87) adaxial acicular hairs:** (0) all more or less uniform in length, (1) obvious distinction between short and long hairs in the same individual; **88) adaxial hair density:** (0) sparse, (1) relatively dense on both sides; **89) adaxial hair orientation:** (0) patent, (1) antrorsely appressed, (2) retrorsely appressed; **90) indumenta (in reference to scales):** (0) absent, (1) present; **91) scales width, define by number of cells:** (0) 1-2 cells, (1) 3-several cells; **92) scales density:** (0) sparse, (1) dense; **93) scales color:** (0) light-brown, (1) castaneous, (2) golden-brown; **94) scales sheen:** (0) lustrous, (1) matte; **95) scales shape:** (0) linear-lanceolate, (1) ovate, (2) ovate-lanceolate, (3) lanceolate-acuminate, (4) other shape;

Table 3 (cont'd)

COSTAE cont'd
96) scales clathrateness: (0) uniformly colored, (1) subclathrate, (2) clathrate throughout; **97) scales indumenta:** (0) glabrous, (1) hairy only, (2) hairy and glandular, (3) glandular only; **98) scales hair density:** (0) sparse, (1) dense; **99) aerophores at costa bases:** (0) absent, (1) present; **100) aerophores shape:** (0) short, clavate, (1) elongate, deltate, (2) aerophores other shape.

COSTULES: **101) abaxial indumenta (in reference to hairs):** (0) glabrous, (1) pubescent; **102) abaxial hair types:** (0) acicular, unicellular, (1) acicular, multicellular, (2) uncinate, (3) fasciculate; **103) abaxial acicular hairs:** (0) all more or less uniform in length, (1) obvious distinction between short and long hairs in the same individual; **104) abaxial hair density:** (0) sparse, (1) relatively dense on both sides; **105) abaxial hair orientation:** (0) patent, (1) antrorsely appressed, (2) retrorsely appressed; **106) adaxial indumenta (in reference to hairs):** (0) glabrous, (1) pubescent; **107) adaxial hair types:** (0) acicular, unicellular, (1) acicular, multicellular, (2) uncinate, (3) fasciculate; **108) adaxial acicular hairs:** (0) all more or less uniform in length, (1) obvious distinction between short and long hairs in the same individual; **109) adaxial hair density:** (0) sparse, (1) relatively dense on both sides; **110) adaxial hair orientation:** (0) patent, (1) antrorsely appressed, (2) retrorsely appressed.

VEINS: **111) vein prominence abaxially:** (0) not prominent, (1) slightly prominent, (2) prominent; **112) vein prominence adaxially:** (0) not prominent, (1) slightly prominent, (2) prominent; **113) veins color:** (0) stramineous, (1) olivaceous, (2) dark, blackish; **114) vein branching pattern:** (0) unbranched, simple, (1) branched; **115) abaxial indumenta (in reference to hairs):** (0) glabrous, (1) pubescent; **116) abaxial hair types:** (0) acicular, unicellular, (1) acicular, multicellular, (2) uncinate, (3) fasciculate; **117) abaxial acicular hairs:** (0) all more or less uniform in length, (1) obvious distinction between short and long hairs in the same individual; **118) abaxial hair density:** (0) sparse, (1) relatively dense on both sides; **119) abaxial hair orientation:** (0) patent, (1) antrorsely appressed, (2) retrorsely appressed; **120) adaxial indumenta (in reference to hairs):** (0) glabrous, (1) pubescent; **121) adaxial hair types:** (0) acicular, unicellular, (1) acicular, multicellular, (2) uncinate, (3) fasciculate; **122) adaxial acicular hairs:** (0) all more or less uniform in length, (1) obvious distinction between short and long hairs in the same individual; **123) adaxial hair density:** (0) sparse, (1) relatively dense on both sides; **124) adaxial hair orientation:** (0) patent, (1) antrorsely appressed, (2) retrorsely appressed.

SORI AND INDUSIA: **125) soral shape:** (0) round, (1) elongate along veins; **126) soral position on veins:** (0) pericostal, (1) inframedial, (2) medial, (3) supramedial to submarginal, (4) marginal; **127) indusia:** (0) absent, or deciduous, (1) small and inconspicuous, tuff of hairs, small lobe, (2) present and persistent; **128) indusial shape:** (0) reniform, (1) small ear-like lobe; **129) indusial color:** (0) light brown, (1) dark brown, (2) atropurpureous; **130) indusial indumenta (in reference to hairs):** (0) absent, (1) present; **131) indusial hair types:** (0) acicular, unicellular, (1) acicular, multicellular, (2) uncinate; **132) indusial hair density:** (0) sparse, (1) relatively dense, (2) ciliate, on margins only; **133) indusial indumenta (in reference to glands):** (0) absent, (1) present; **134) indusial gland types:** (0) globular, sessile, (1) globular, stalked, (2) hairlike (capitate); **135) indusial glands color:** (0) reddish, (1) yellowish, (2) hyaline; **136) glands density on indusial surface:** (0) sparse, (1) dense; **137) acicular hairs on sporangia:** (0) absent, (1) present.

Table 4. Morphological characters used in the study of Caribbean amauropeltoid ferns: Quantitative characters.

RHIZOMES: **138)** diameter (cm)*; **139)** scales, length (mm); **140)** scales, width (mm); **141)** scale hairs, length (mm).

LEAVES: **142)** length (cm)*.

PETIOLES: **143)** length (cm)*; **144)** diameter (cm)*; **145)** hairs, length (mm).

RACHISES: **146)** diameter (cm)*; **147)** hairs, length (mm); **148)** scales, length (mm); **149)** scales, width (mm); **150)** scale hairs, length (mm).

LAMINAE: **151)** length (cm)*; **152)** width (cm)*; **153)** number of proximal reduced pinnae pairs*; **154)** laminar tissue abaxial hairs, length (mm); **155)** laminar tissue adaxial hairs, length (mm).

PINNAE: **156)** number of non-reduced pinnae pairs*; **157)** longest pinnae, length (cm)*; **158)** longest pinnae, width (cm)*; **159)** segments, width (cm)*; **160)** costa-sinus distance (mm)*.

COSTAE: **161)** abaxial hairs, length (mm); **162)** adaxial hairs, length (mm); **163)** abaxial costal scales, length (mm); **164)** abaxial costal scales, width (mm); **165)** abaxial costal scales hairs, length (mm).

COSTULES: **166)** abaxial hairs, length (mm); **167)** adaxial hairs, length (mm).

VEINS: **168)** number of vein pairs per segment*; **169)** abaxial hairs, length (mm); **170)** adaxial hairs, length (mm).

INDUSIA: **171)** indusial hairs, length (mm).

* Measurements taken using the software tpsDIG2 ver. 2.12 based on digital images from herbarium specimens.

APPENDIX D

Protologues and protologue abbreviations

Table 5. Protologues and protologue abbreviations standardized after the International Plant Names Index (IPNI).

PUBLICATION TITLE, AUTHORS, YEAR, VOLUME	ABBREVIATION
Abhandlungen Herausgegeben von der Senckenbergischen Naturforschenden Gesellschaft. Frankfurt a. M	Abh. Senckenberg. Naturf. Ges.
Adansonia; recueil (périodique) d'observations botaniques. Paris	Adansonia
Adnotationes Botanicae …	Adnot. Bot.
American Fern Journal; a quarterly devoted to ferns.	Amer. Fern J.
Annales des Sciences Naturelles; Botanique	Ann. Sci. Nat., Bot.
Annals of Botany. Oxford	Ann. Bot. (Oxford)
Botanische Jahrbücher für Systematik, Pflanzengeschichte und Pflanzengeographie. Leipzig	Bot. Jahrb. Syst.
Botanische Zeitung. Berlin	Bot. Zeitung (Berlin)
British Fern Gazette. Kendal, England	Brit. Fern Gaz.
Bulletin de l'Herbier Boissier	Bull. Herb. Boissier
Bulletin of Miscellaneous Information, Royal Gardens, Kew. Kew	Bull. Misc. Inform. Kew
Bulletin of the Botanical Department. Kingston, Jamaica	Bull. Bot. Dept. Jamaica
Bulletin of the Fan Memorial Institute of Biology; Botany. Peiping [Beijing]	Bull. Fan Mem. Inst. Biol. Bot.
Bulletin of the Institute of Jamaica. Science Series	Bull. Inst. Jamaica, Sci. Ser.
Bulletin of the Torrey Botanical Club. New York	Bull. Torrey Bot. Club
Conspectus of Southern African Pteridophyta. An enumeration of the Pteridophyta of Angola, Botswana, Lesotho, … and Zimbabwe	Conspect. South. Afr. Pteridophyta
Contributions from the Gray Herbarium of Harvard University. Cambridge, MA	Contr. Gray Herb.
Cryptogames Vasculaires (fougéres, Lycopodiacées, Hydroptéridées, Equisétacées) du Bresil	Crypt. Vasc. Bresil
Dansk Botanisk Arkiv Udgivet af Dansk Botanisk Forening. Copenhagen	Dansk Bot. Ark.
Description des Plantes de l'Amérique	Descr. Pl. Amér.
Die Farrnkräuter in kolorirten Abbildungen naturgetreu erläutert und beschrieben von Dr. G. Kunze Schkuhr's Farrnkräuter Supplement 2	Farrnkräuter
Die Natürlichen Pflanzenfamilien	Nat. Pflanzenfam. [Engler & Prantl]
Eclogae Americanae	Eclog. Amer.
Encyclopedie Methodique. Botanique ... Paris	Encycl. (Lamarck)
Farnkrauter der Erde Christ, Konrad Hermann Heinrich 1897	Farnkr. Erde
Feddes Repertorium. Zeitschrift für Botanische Taxonomie und Geobotanik. Berlin	Feddes Repert.
Ferns: British & Foreign. Edition 1...London	Ferns Brit. For.
Filices Horti Botanici Lipsiensis...Leipzig	Fil. Hort. Bot. Lips.

Table 5 (cont'd)

PUBLICATION TITLE, AUTHORS, YEAR, VOLUME	ABBREVIATION
Filicetum Americanum, seu filicum, polypodiorum, adiantorum etc. In America nascentium icones. Paris	Filic. Amer.
Flora of Ecuador (18). Stockholm. Eds. G. Harling, B. Sparre, and L. Andersson	Fl. Ecuador
Flora of the British West Indies Islands	Fl. Brit. W.I. [Grisebach]
Flora, oder (Allgemeine) Botanischer Zeitung. Regensberg, Jena	Flora
Gardener's chronicle. London	Gard. Chron.
Genera Filicum (Copeland)	Gen. Fil. (Copeland)
Hedwigia. Ein Notizblatt für kryptogamische Studien	Hedwigia
Hortus Regius Botanicus Berolinensis... Link, Johann Heinrich Friedrich 2 volumes: 1, 1 Oct-27 Nov 1827; 2, Jul-Dec 1833	Hort. Berol. [Link]
Index Filicum sive Enumeratio Omnium Generum Specierumque Filicum et Hydropteridium... Christensen, Carl Frederick Albert	Index Filic.
Index Filicum, Supplementum 1906-1912 Christensen, Carl Frederick Albert	Index Filic., Suppl. 1906-1912
Index Filicum: a synopsis, with characters, of the genera... Moore, Thomas	Index Fil. (T. Moore)
Index to North American Ferns	Index No. Amer. Ferns
Journal für die Botanik. [Edited by H. A. Schrader]. Gőttingen	J. Bot. (Schrader)
Journal of Botany, (Being a Second Series of the Botanical Miscellany), Containing Figures and Descriptions. London	J. Bot. (Hooker)
Journal of Botany, British and Foreign. London Vols. 1-80, 1863-1942	J. Bot.
Journal of the Washington Academy of Sciences. Baltimore, MD	J. Wash. Acad. Sci.
Kongelige Danske Videnskabernes Selskabs Skrifter. Naturvidenskabelige og Mathematiske Afdeling	Kongel. Danske Vidensk. Selsk. Skr., Naturvidensk. Math. Afd.
Kongl[iga]. Svenska Vetenskaps Akademiens Handlingar. Stockholm	Kongl. Svenska Vetensk. Acad. Handl.
Leaflets of Western Botany. San Francisco, CA	Leafl. W. Bot.
Linnaea; Ein Journal für die Botanik in ihrem ganzen Umfange. Berlin Vols. 1-43, 1826-82; [Vols. 35-43 (1867-82) also numbered n.s., vols. 1-9]	Linnaea
Magazin für die neuesten Entdeckungen in der gesammten Naturkunde, Gesellschaft Naturforschender Freunde zu Berlin . Berlin Vols. 1-8, 1807-1818	Mag. Neuesten Entdeck. Gesammten Naturk. Ges. Naturf. Freunde Berlin

Table 5 (cont'd)

PUBLICATION TITLE, AUTHORS, YEAR, VOLUME	ABBREVIATION
Magazine of Natural History. London Vols. 2-4, 1838-1840	Mag. Nat. Hist.
Mémoires de la Société Linnéenne de Paris. Paris	Mém. Soc. Linn. Paris
Mémoires sur les Familles des Fougères; Cinquieme Mémoire, Genera Filicum Fée, Antoine Laurent Apollinaire, 1850-52	Mém. Foug., 5. Gen. Filic.
Mémoires sur les Familles des Fougères; Onzieme Mémoire, Histoire des Fougères et des Lycopodiacées des Antilles Fée, Antoine Laurent Apollinaire, 1866	Mém. Foug., 11. Hist. Foug. Antil.
Mexicanas Plantas Nuper a Collectoribus Expeditionis Scientificae Allatas aut Longis ab Annis in Herbario Musei Parisiensis Depositas Praeside J. Decaisne... Enumerandas Curavit Eug. Fournier, Paris Fournier, Eugene Pierre Nicolas, pars prima, 1872; pars secunda, Apr-May 1886	Mexic. Pl.
Nova Acta Physico-medica Academiae Caesareae Leopoldino-Carolinae Naturae Curiosorum Exhibentia Ephemerides sive Observationes Historias et Experimenta ... Vols. 1-19(1) [vols. 11-19 also numbered Decas[1](=series) 2, vols. 1-9], 1757-1839	Nova Acta Phys.-Med. Acad. Caes. Leop.-Carol. Nat. Cur.
Nova Genera et Species Plantarum Kunth, Karl Sigismund, vols. 1-7: 1815-1825	Nov. Gen. Sp. [H.B.K.]
Nova Genera et Species Plantarum seu Prodromus descriptionum Vegetabilium, maximam partem incognitorum quae sub itinere in Indiam Occidentalem annis 1783-87. Swartz, Olof Peter, 20 Jun-29 Jul 1788	Prodr. (Swartz)
Novara Exp. Bot.	Novara Exp. Bot.
Proceedings of the Biological Society of Washington	Proc. Biol. Soc. Wash.
Recensio Cryptogamarum Vascularium Provinciae Quitensis Sodiro, Luis	Recens. Crypt. Vasc. Quit.
Reliquiae Haenkeanae Presl, Carl Boriwaj	Reliq. Haenk.
Repertorium Specierum Novarum Regni Vegetabilis. Centralblatt für Sammlung und Veroffentlichung von Einzeldiagnosen neuer Pflanzen. Beihefte. [Edited by Friedrich Fedde]. Berlin Vols. 1-51, 1905-1942	Repert. Spec. Nov. Regni Veg.

Table 5 (cont'd)

PUBLICATION TITLE, AUTHORS, YEAR, VOLUME	ABBREVIATION
Repertorium Specierum Novarum Regni Vegetabilis. Centralblatt für Sammlung und Veroffentlichung von Einzeldiagnosen neuer Pflanzen. Beihefte. [Edited by Friedrich Fedde]. Berlin Vols. 1-51, 1905-1942	Repert. Spec. Nov. Regni Veg.
Revisio Generum Plantarum: vascularium omnium atque cellularium multarum secundum leges nomeclaturae internationales cum enumeratione plantarum exoticarum in itinere mundi collectarum ... Leipzig Kuntze, Carl Ernst Otto	Revis. Gen. Pl.
Revista del Museo de La Plata, Argentina	Revista Mus. La Plata
Rhodora; Journal of the New England Botanical Club. Cambridge, MA	Rhodora
Rozprava Kralovske Ceske Spolecnosti Nauk, Trida Mat.-Prirodovedecke [or] Memoirs of the Royal Czech Society of Sciences, Division of Natural History and Mathematics New Series (N.s.), vols. 1-3, 1928-1929 Vol. 2. 1929. = The Pteridophyta of the Island of Dominica, by Karel Domin	Rozpr. Kral. Ceske Spolecn. Nauk, Tr. Mat.-Prir.
Smithsonian Miscellaneous Collections. Washington, D.C.	Smithsonian Misc. Collect.
Species Filicum Hooker, William Jackson, 5 vols.; 1, 1844-1846; 2, 1858; 3, 1860; 4, 1862; 5, 1864	Sp. Fil.
Species Plantarum Linnaeus, Carl, 1753	Sp. Pl.
Species Plantarum. Editio Quarta. Berolini [Berlin] Willdenow, Carl Ludwig von	Sp. Pl., ed. 4 [Willdenow]
Symbolae Antillanae: seu fundamenta florae Indiae occidentalis ... Berlin Urban, Ignatz	Symb. Antill. (Urban).
Synopsis Filicum (Hooker & Baker) 10 Parts: 1865-1868	Syn. Fil. (Hooker & Baker)
Systema Naturae ...Editio decima, reformata... Linnaeus, Carl, vol.s 1-2; 1758-1759; vol. 1(animalia): 1 Jan 1758; vol. 2(vegetabilia): 7 Jun 1759	Syst. Nat., ed. 10.
Tentamen Pteridographiae Presl, Carl Boriwaj, shortly before 2 Dec 1836	Tent. Pterid.
Traité des Fougéres de l"Amerique ... Paris Plumier, Charles, 1705	Traité Foug. Amér.
University of California Publications in Botany. Berkeley, CA	Univ. Calif. Publ. Bot.
Webbia; Raccolta de Scritti Botanici. Florence	Webbia
Willdenowia. Mitteilungen aus dem Botanischen Garten und Museum Berlin-Dahlem. Berlin-Dahlem	Willdenowia

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