Guatemalan Ecosystems

Taxonomy and Ecology

Bryophyta and Pteridophyta

Livingston, Guatemala

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Content:

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- Generalities
- Taxonomy
- Ecology
- Bryophyta of Livingston

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- New clasification
- Diagnostic characters
- Taxonomy
- Ecology
- Pteridophyta of Livingston

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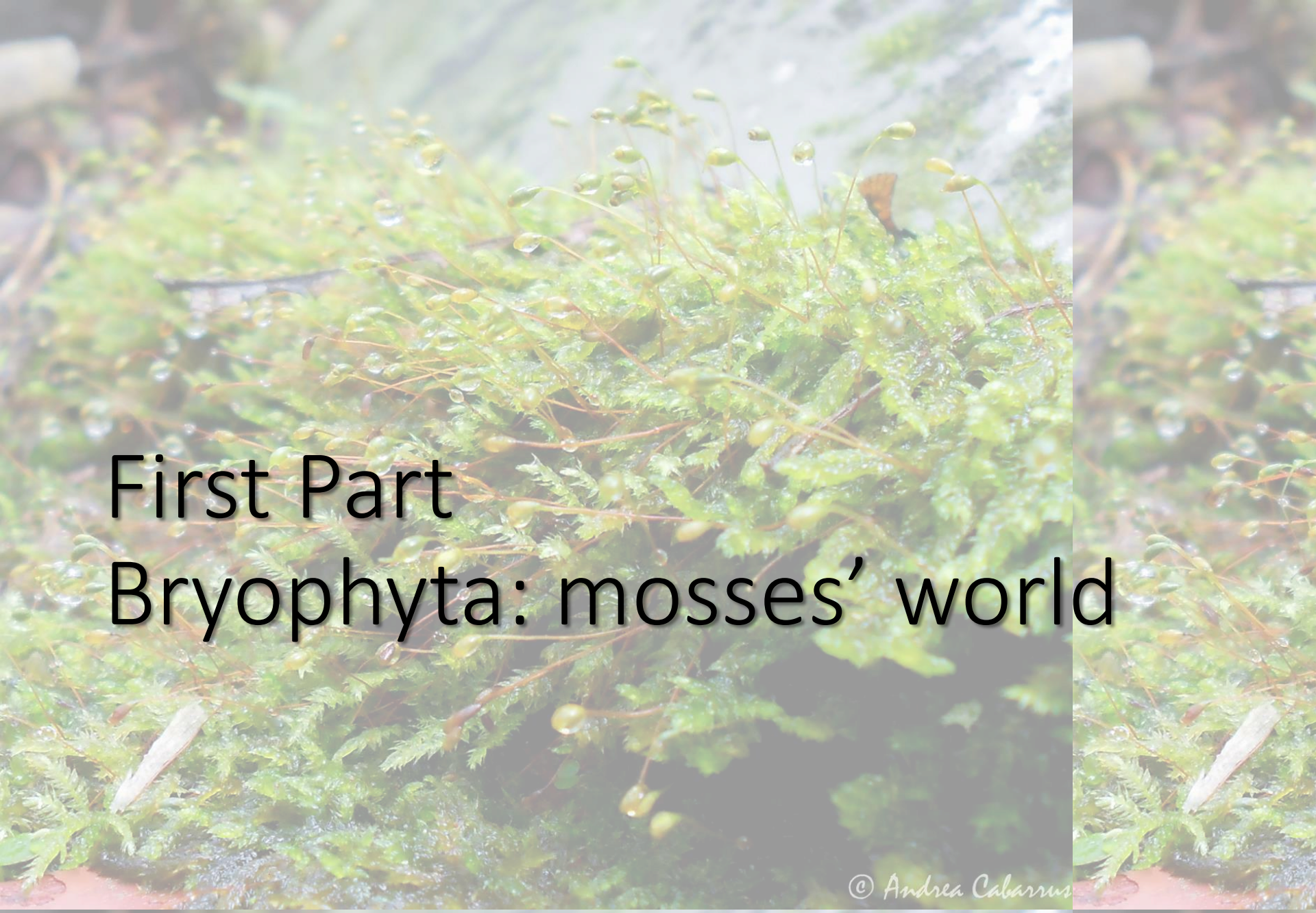

First Part
Bryophyta: mosses' world

Generalities

- Lawrence (2003) defines Bryophyta as the Phyllum of the Kingdom Plantae that includes mosses, liverworts, and Anthocerophyta.
- All these organisms share that they are small non-vascular plants
- With an estimated 25,000 species around the world, it is believed that they are the closest relatives to the actual terrestrial plants, including ferns.
- They have inhabited the planet for 300 million years
- This group has been almost not studied at all, especially in the tropics, however Gradstein, Salazar-Allen, & Churchill (2002) created the most complete key to Neotropical Bryophytes that exists today.
- For GT, a total of 519 species are currently accepted among the three groups, it is one of the least studied taxa for the region.

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- It is considered a paraphyletic group that considers three Divisions:
  - the Hepatic or Marchantophyta Division.
  - the Mosses or Division Bryophyta.
  - the Anthoceros / Anthoceronts or Division Anthocerophyta.

- The three divisions have in common that: they lack vascular tissues, this means that they do not have xylem or phloem; they also do not have true roots, stems or leaves and do not produce seeds – spore reproduction.

- They tend to be small organisms that generally do not exceed 10 cm. They are fragile and of grouped growth forming large mattresses, carpets or groups.

- As they lack conductive tissues and the water travels by capillarity only.

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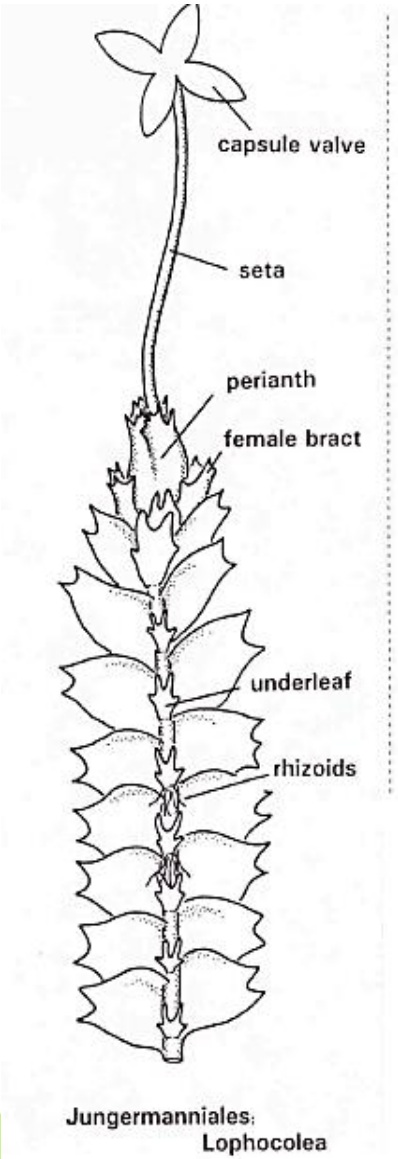
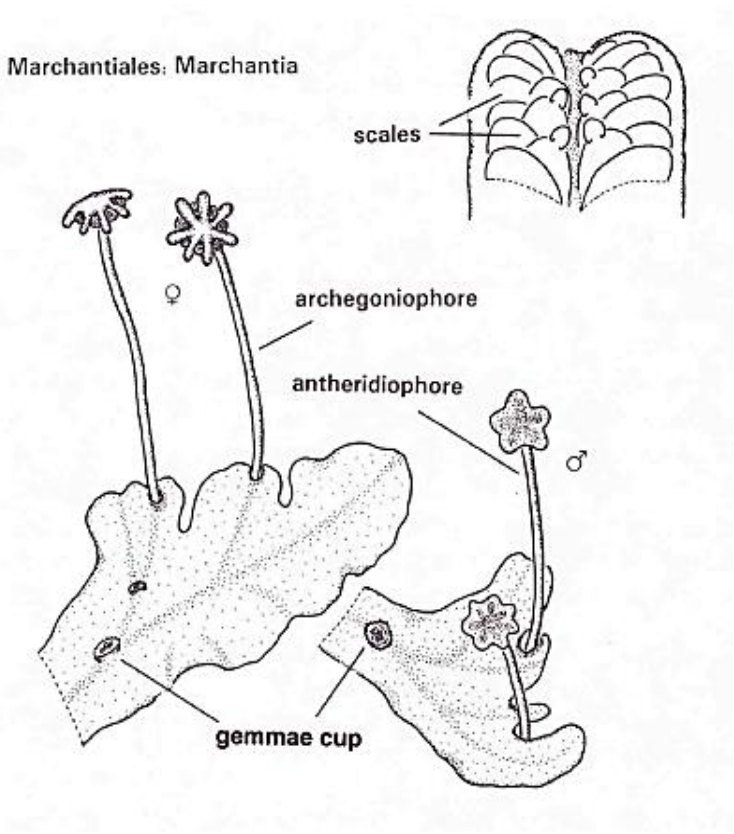
Taxonomy and Clasification





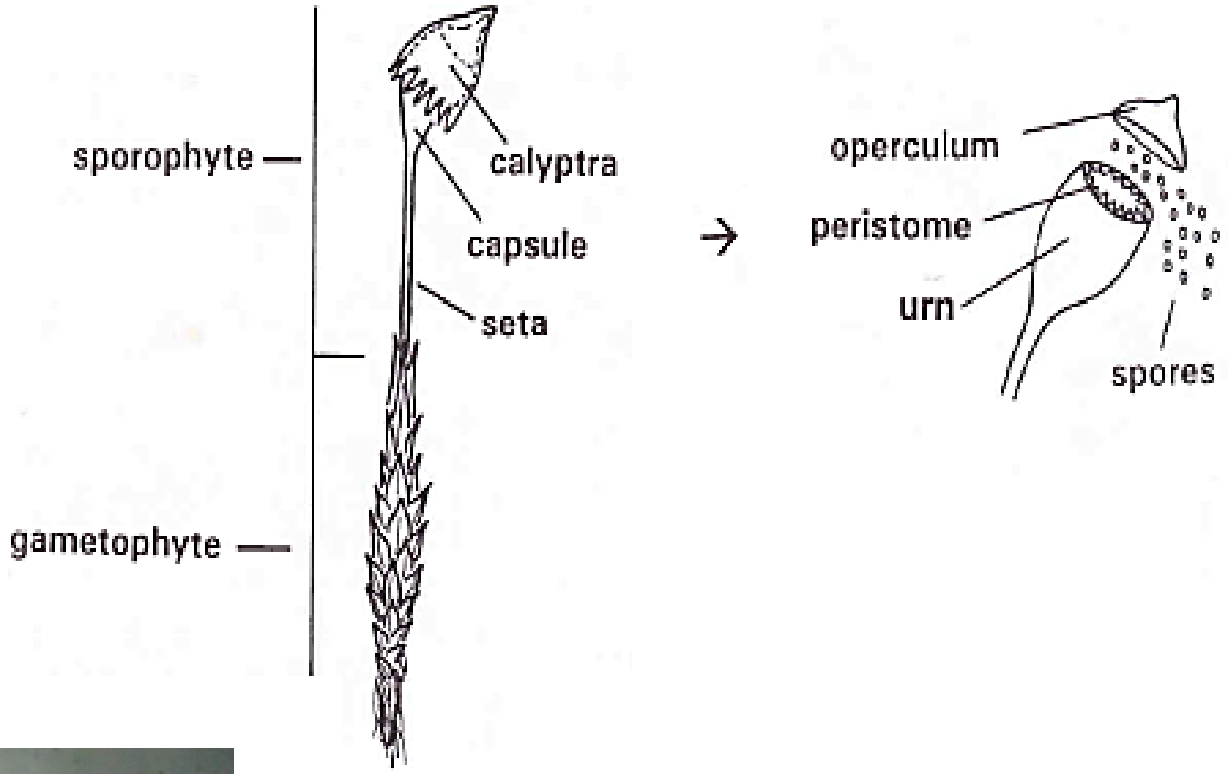
Basic anatomy, adapted from Gradstein, Salazar-Allen, & Churchill (2002). **A.** Gén. *Lophocolea* **B.** Gén. *Marchantia*: **1.** Escamas ventrales; **2.** Vista dorsal.

Hepatics

Bryopteris sp.

Marchantia sp.

Mosses

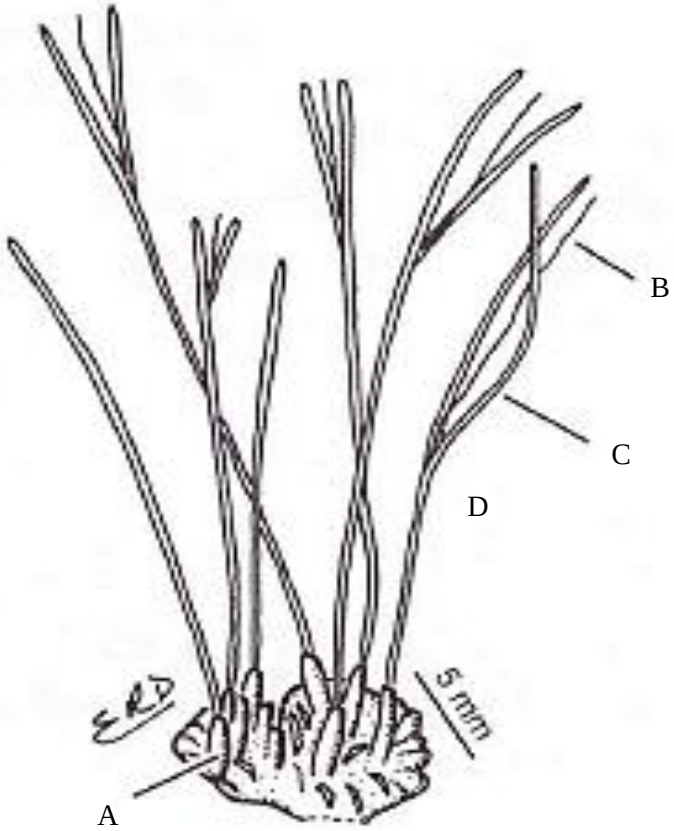


Basic anatomy, adapted from Gradstein, Salazar-Allen, & Churchill (2002). **A.** Gametophyte and Sporophyte.

Mosses

Example: *Fabronia* sp.

Anthoceros / Anthoceronts



Basic Anatomy (Gén. *Anthoceros*), adapted from Gradstein, Salazar-Allen, & Churchill (2002). **A.** Gametophyte . **B.** involucre. **C.** columel. **D.** capsule.

Ecology

- They are present in most terrestrial and freshwater ecosystems, but they are not present in marine environments.

- They are highly adaptable.

- Bryophytes are an important part of the first successional stages, since many are exclusive to open, sunny and shade-intolerant sites, this allows them to establish themselves in exposed and disturbed environments

- They can also survive years in a dormant state when they go into desiccation, and when re-moistened they can "revive"

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Why are they important?

1. Plant succession
2. Microhabitats
3. Water / moisture reservoirs
4. Agents against soil erosion / loss
5. Nutrient fixatives (especially N)

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Livingston's Bryophytes

- It is believed that the Guatemalan Brioflora can be divided into 3 altitudinal regions:
- The lowland region with altitudes ranging from sea level to about 1,500 mats
- The central region, formed by the altiplano. There are families ranging from 1,500 to 3,500 meters above sea level.
- The rocky region of the west and northern area, with altitudes above 3,500 meters above sea level. The families of this region are usually "Andean".

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Brioflora of Central America

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Second Part: Pteridophyta, the world of ferns

New Classification

- Phyllum Lycopodiophyta
  - Lycopodiales
  - Selaginelalles
  - Isoëtales

- Polypodiophyta
  - Equisetidae -> Equisetales -> Equisetaceae
  - Ophioglossidae -> Ophioglossales y Psilotales
  - Marattiidae -> Marattiales -> Marattiaceae
  - **Polypodiidae**

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Diagnostic characters

- Vascular plants
- Reproduction by means of…. SPORES -> **absence of flowers or cones**
- Alternation of generations
  - **Independent gametophyte (n)**
  - **Independent sporophyte (2n)**
- habit? Prefoliation? Shapes and sizes? Any other structure and / or indument?

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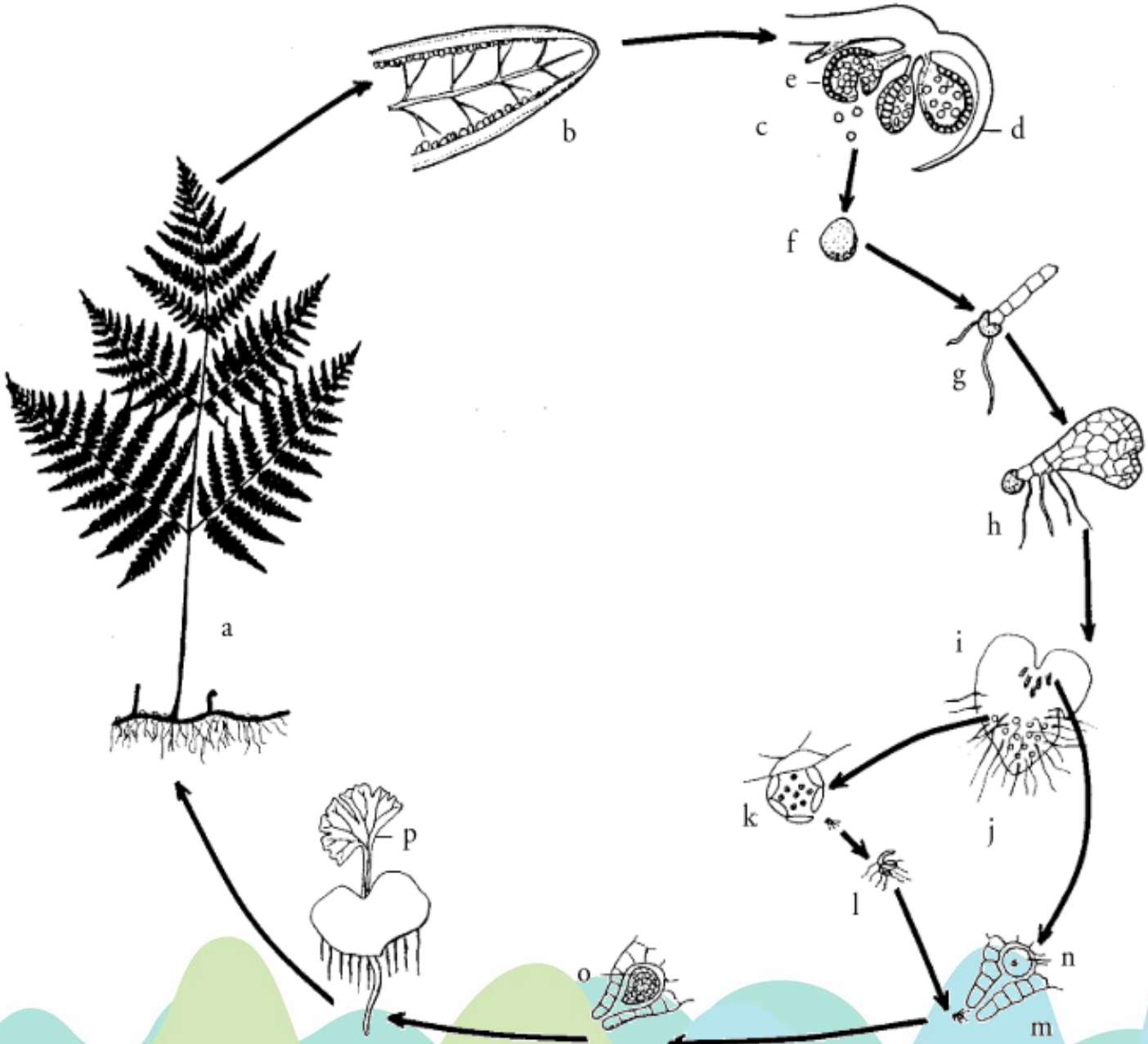

Adapted from Hoshizaki & Moran, (2001).

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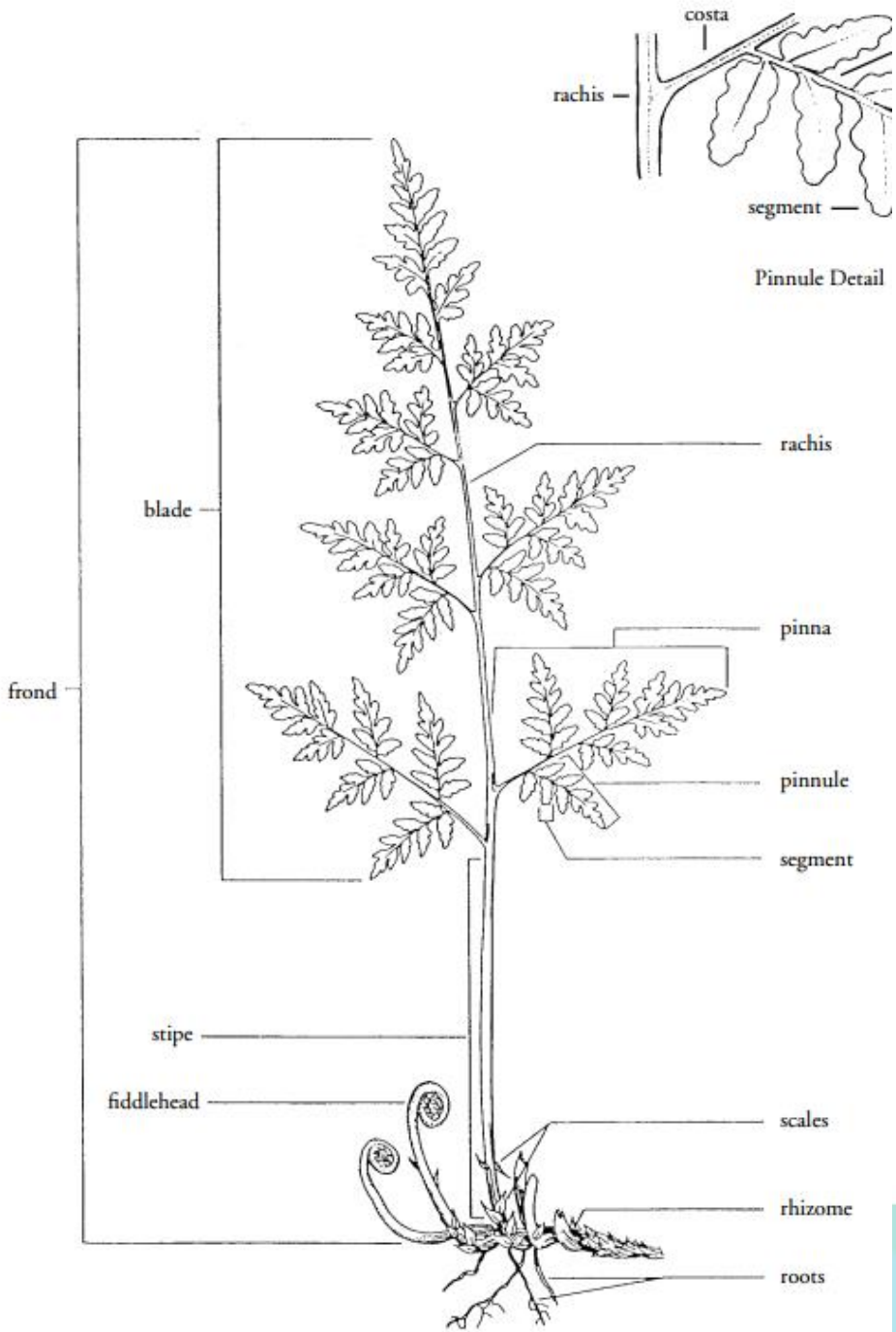

General scheme of a fern sporophyte. The morphology of a compound lamina fern is observed, the most common in ferns. In this case, the rhizome is shortly crackly and has scales as an indument, as does the base of the stem. Adapted from Hoshizaki & Moran, (2001).

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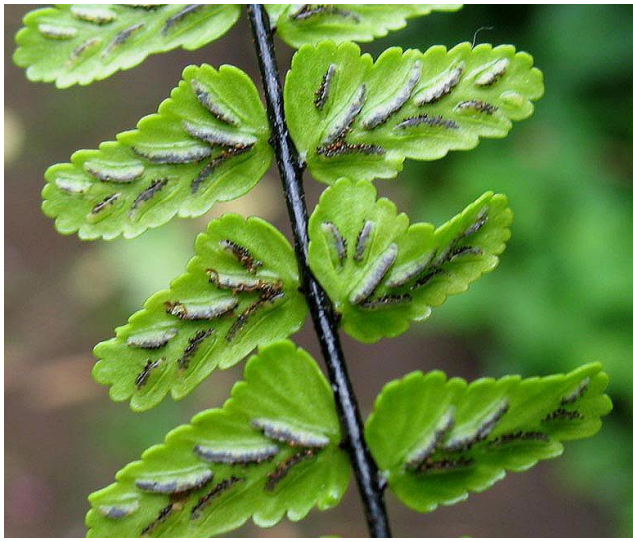

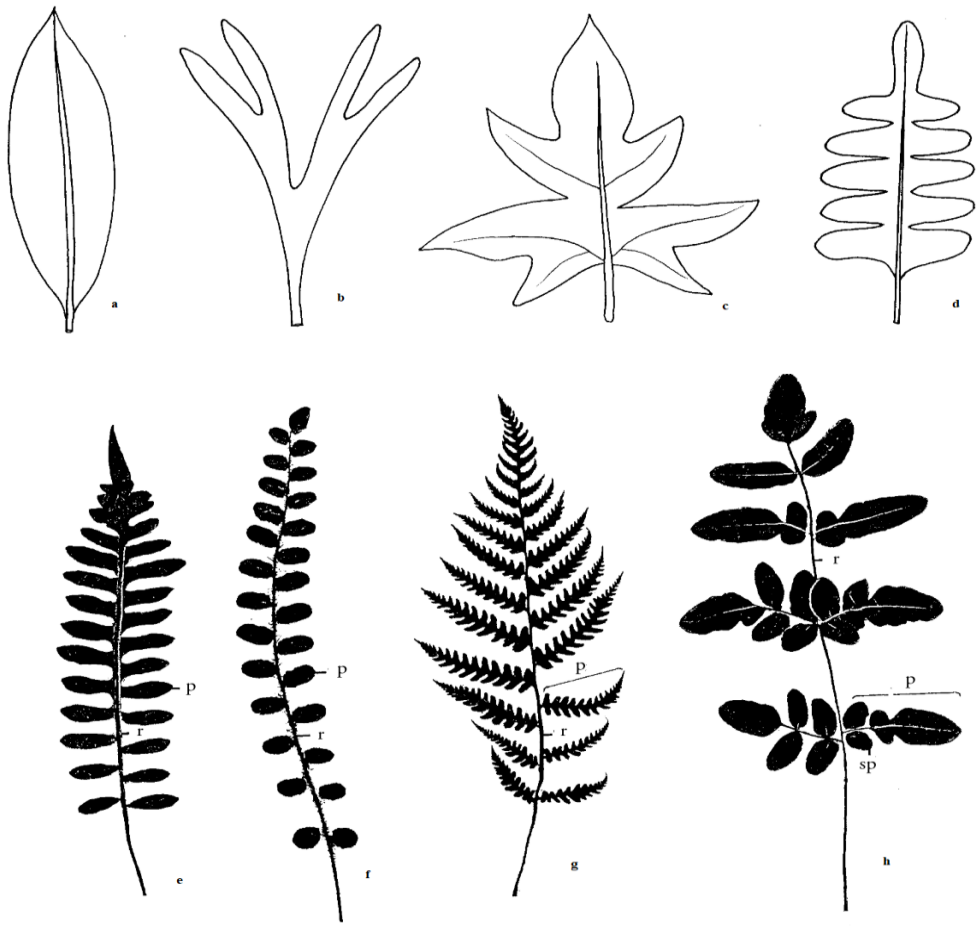

Examples of laminae in ferns. (r = rachis; p = pinna; sp = subpinna, pinula or last segment). Some of the more common conformations are seen in the blades of fern fronds. A) simple sheet; B) lamina simplex deeply lobed; C) simple pinathiform palmatiform lamina; D) simple pinathifid lamina; E) 1 time pinnate with pinatifid apex; F) 1 pinnate; G) 1-time pinnate-pinathifid; H) bipinnate (2-fold pinnate). Adapted from Hoshizaki & Moran, (2001).

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Taxonomy

- There are about 12,000 fern species identified worldwide, of which between 680 and 782 have been identified in Guatemala (Christenhusz & Chase, 2014; Hoshizaki & Moran, 2001; Jiménez, 2009b; Smith et al., 2008; Véliz , 2008; Véliz & Vargas, 2006).

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Ferns & Lycophytes

Family

Acceptance: Accepted

Aspleniaceae Newman (Description)
Athyriaceae Alston (Description)
Blechnaceae Newman (Description)
Cibotiaceae Korall (Description)
Cyatheaceae Kaulf. (Description)
Cystopteridaceae Shmakov (Description)
Davalliaceae M.R. Schomb. ex A.B. Frank (Description)
Dennstaedtiaceae Lotsy (Description)
Diplaziopsidaceae X.C. Zhang & Christenh. (Description)
Dipteridaceae Seward & E. Dale (Description)
Dryopteridaceae Herter (Description)
Equisetaceae Michx. ex DC. (Description)
Gleicheniaceae C. Presl (Description)
Hymenophyllaceae Mart. (Description)
Hypodematiaceae Ching (Description)
Isoetaceae Dumort. (Description)
Lindsaeaceae C. Presl ex M.R. Schomb. (Description)
Lomariopsidaceae Alston (Description)
Lycopodiaceae P. Beauv. ex Mirb. (Description)
Lygodiaceae M. Roem. (Description)
Marattiaceae Kaulf. (Description)
Marsileaceae Mirb. (Description)
Nephrolepidaceae Pic. Serm. (Description)
Oleandraceae Ching ex Pic. Serm. (Description)
Onocleaceae Pic. Serm. (Description)
Ophioglossaceae Martinov (Description)
Osmundaceae Martinov (Description)
Plagiogyriaceae Bower (Description)
Polypodiaceae J. Presl & C. Presl (Description)
Psilotaceae J.W. Griff. & Henfr. (Description)
Pteridaceae E.D.M. Kirchn. (Description)
Rhachidosoraceae X.C. Zhang (Description)
Salviniaceae Martinov (Description)
Schizaeaceae Kaulf. (Description)
Selaginellaceae Willk. (Description)
Tectariaceae Panigrahi (Description)
Thelypteridaceae Ching ex Pic. Serm. (Description)
Woodsiaceae Herter (Description)

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Ecology

- Ferns are an essential part of ecosystems, and within the forests they inhabit, together with other epiphytes, they are essential for water cycles, (especially in cloud forests with a high presence of horizontal rain), nitrogen, phosphorus, carbon and other compounds.

- Many ferns, along with bryophytes and lichens, are pioneers or inhabit open environments, especially in the tropics and subtropics

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- They have influence in the dynamics of seed and spore germination, as well in the adaptation of other species.

- Ferns in cloud forests have been used, among other things, as indicators of environmental change, biological diversity, change in land use, among others.

- The persistence of ferns in one place is only possible if the niches made of the development phases coincide: spores, gametophytes and sporophytes.

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Livingston's ferns

- As occurs in the forested areas of GT, the variety of ferns in the region is important.
- There are some of the characteristic families of the tropical region.
- The conditions: humidity, changes in land use, temperature and nutrient availability are the main factors to have in mind.

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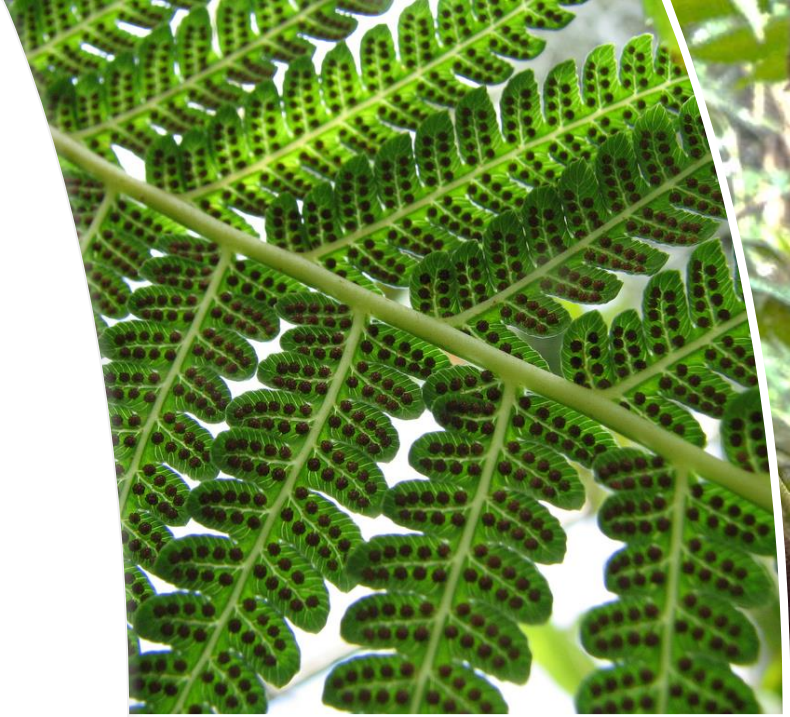
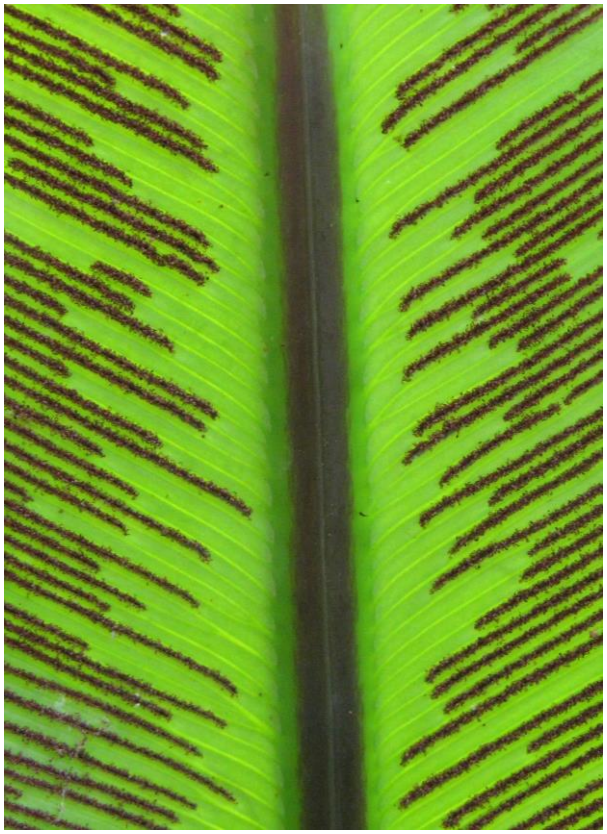
Marattiaceae


Hymenophyllales

Gleicheniaceae

Cyatheaceae



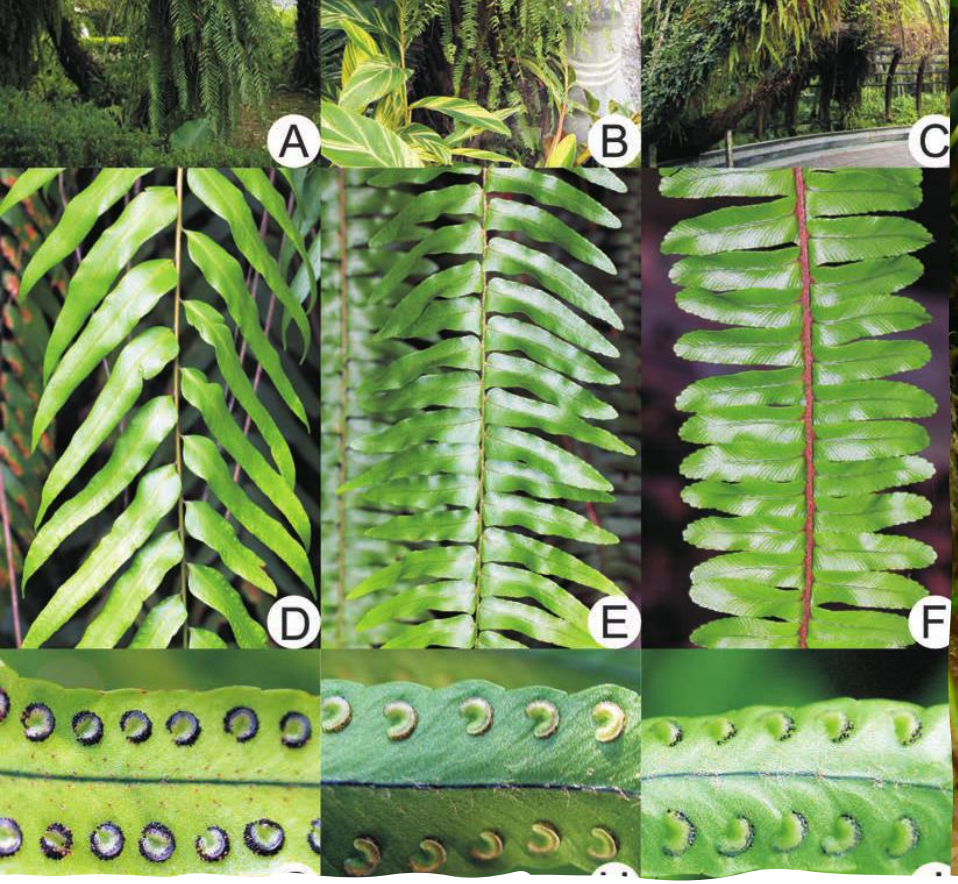


Aspleniaceae

Thelypteridaceae

Blechnaceae


Polypodiaceae



Davallinaceae


Dryopteridaceae
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Pteridaceae

Conclutions

- Diversity is high in both taxa for Livingston
- More research is required to increase the state of knowledge of both taxa.
- It requires training of more people interested in botany; citizen participation is the key.

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