

# Common Epiphytes and Lithophytes of BELIZE

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**EPIPHYTE OVERVIEW:** Most plants produce roots in the ground, but in the tropics and subtropics, **EPIPHYTES**, sometimes called *air plants*, are found. Epiphytes are plants that grow upon another plant, employing a variety of adaptive strategies to survive and reproduce. These interesting plants may be found on their hosts from buttress roots, at low trunk level, or more frequently in the shrub or forest canopy. In Greek the terms *epi* and *phyte* literally mean that which is found *above* or *on* a plant. Mistletoes might be included in this category, but here we consider only the free-living plants that obtain, and then conduct water and nutrients through their internal systems.

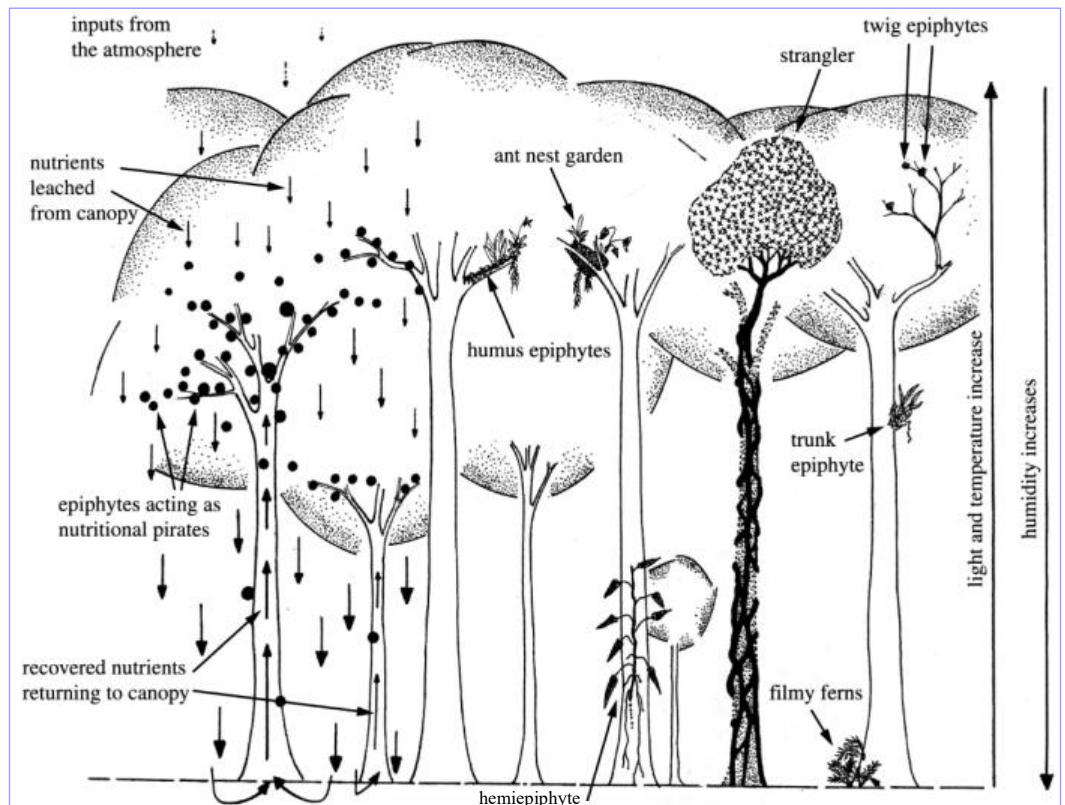
Epiphytes are often broken down here into two classes, **holoepiphytes**, which are obligate “full-time” epiphytes (the majority included here and referred to as “epiphytes”) and **hemiepiphytes**. The latter class is broadly identified as those plants that begin their life in the ground, and then climb into the canopy vine-like, or plants that germinate in the canopy and eventually make root contact with the ground. Some plants are equally successful growing on rocks and then are generally termed **LITHOPHYTES**, and employ the same survival strategies as do the epiphytes.

The presence of vascular epiphytes is primarily a tropical phenomenon with the highest species concentrations in the Americas. Epiphytic plants reach their peak species diversity in humid mid-elevation sites a-

long the eastern slopes of the Andes and in Brazil's Atlantic Forest biome. In these places where conditions are favorable, epiphytes account for up to half of the total vascular plant species. Worldwide, epiphytes account for nearly 10 percent of all vascular plant species. Epiphytism (the ability to grow as an epiphyte) has arisen many times in the plant kingdom around the world.

In Belize, epiphytes are represented by 34 vascular plant families which grow abundantly in many shrublands and forests. Approximately 15% of the Belizean flora is epiphytic or lithophytic. The focus in this guide is the vascular epiphytes, hemiepiphytes and lithophytes; non-vascular plants such as mosses and liverworts are not included.

The main goal of this work is to help you to identify the most common epiphytes in Belize, which are found in the following seven flowering families: **Araceae**, **Bromeliaceae**, **Cactaceae**, **Gesneriaceae**, **Orchidaceae**, **Piperaceae**, and several spore-bearing fern families (**Aspleniaceae**, **Nephrolepidaceae**, **Polypodiaceae**). Some of the lesser-known epiphytic species can be found on p. 6.



Light, humidity, minerals, and host structure play an important role in determining where particular types and classes of epiphytes grow. Here, epiphytes are classified by mode of mineral intake and location on the host (terms defined in glossary; image, courtesy D.H. Benzing).



**EPIPHYTE ADAPTIVE STRATEGIES.** Life above ground is attended by advantages and challenges. To be perched in the crown of a forest tree spares the epiphyte the time and cost required to produce a trunk to find light. Lacking access to soil means nutrients can be hard to come by and droughts are commonplace, though some epiphytes can survive in near desert conditions where fog may be the only source of water.

In healthy ecosystems, epiphytes and their hosts appear to reach equilibrium and both are able to reach reproductive age. The symbiotic relationship may be commensal (one benefits and one is not affected) or possibly mutualistic (both benefit). The advantage at first glance seems to be to the epiphyte which intercept water and nutrients before they reach the hosts roots in the soil, by intercepting sunlight before it reaches the host leaves, and, having the ability to reach maturity without significant energy outlay into the production of woody tissue. Benefits to the host are not well understood, but may be afforded by the increase in biodiversity in the ecosystem and subsequent increase in pollinators, seed dispersers, humidity levels, and microbiota. In some cases strangling hemiepiphytes such as in the genus *Ficus* (Moraceae) are parasitic in that they use the host for support, cast shade upon it, compete for nutrients and water such as do most epiphytes, but they also can physically restrict the flow of water and nutrients in the host tissue and in some cases even kill the host.

Most plants on Earth in order to grow and reproduce follow the main principle: obtain sufficient sunlight, water, carbon dioxide, and minerals. Epiphytic plants are no exception, but have taken it a step further by employing adaptations often found in arid climates, among others, to help them survive in the canopy. Some of these are:

**Plant structure**

- A modest or small mature body size allows the colonization of branches and twigs and greater access to sunlight.

- Rosette or trash-basket growth form helps to channel water and organic debris into the plant's root zone.
- Water-impounding tank formation allows a plant to store water among its leaves (especially in Bromeliaceae).
- Strong roots to secure plant body to host.

**Drought-tolerance and -avoidance**

- Leaf surfaces thick and waxy to minimize water loss
- Succulent, water-storing leaves and stems.
- Ability to wilt severely during drought and recover leaf turgidity when water is abundant.
- Deciduous foliage to minimize water loss during dry seasons.
- CAM-type photosynthesis (“crassulacean acid metabolism”), a photosynthetic pathway that minimizes water loss. Leaf pores are closed during the day and open at night to absorb carbon dioxide when the evaporative power of the atmosphere is lower than by day. This is converted to malic acid which later is converted to sugars for the plants. This pathway is used by more than half of the epiphytes.

**Water and nutrients**

- Adventitious root production that can mine nutrients/water from cavities and from moss-mats on branches.
- Roots covered with spongy tissue termed vellum absorb water and nutrients quickly (Araceae, Orchidaceae).
- Absorptive trichomes (plant “hairs”) on Bromeliaceae leaves capture water and nutrients from the environment.

**Reproductive strategies**

- Rapid maturity; tendency toward smaller fruit and seeds aids dispersal.
- Mutualistic relationships with animals help to defend from herbivores, aid in bringing nutrients to the plant, pollinating the flowers, and dispersing seed.



Epiphytes and lithophytes from north to south. Left, *Selenicereus testudo* (Cactaceae) hang from tree branches in El Tigre Preserve, Corozal. Center, bromeliads and orchids atop a rock outcrop on Baldy Beacon, Cayo. Right, bromeliads and ferns in a mangrove forest in Sarstoon-Temash National Park, Toledo (photos BH).



**OVERVIEW OF PLANT FAMILIES:** Following is a review of the common families or groups of epiphytes and lithophytes of Belize.

**PTERIDOPHYTA** (“ferns”) reproduce by spores which are usually found on the lower leaf surfaces as distinct round to linear, or less commonly scattered groups along the veins or along the margins called sori (1–5). These are sometimes covered by protective structures termed indusia (singular, indusium) (6). Their leaves (or fronds) are often arranged in compact rosettes on a short stem difficult to see (11; also termed a rhizome), or can be borne along a thickened and short, fleshy stem (7), or slender and elongated stem (8). The leaves can be pendent (9) to more commonly erect or spreading (10, 11), they may be simple to many-times divided, but epiphytic ferns tend to have simple (4, 10) or once-divided leaves (2, 9, 11). When young, leaves are rolled up in a characteristic bud, often called a fiddlehead or crozier (12) and unfurl as they develop. Epiphytic fern leaf length in Belize ranges from about 1 cm (the rare *Hecistopteris pumila*) to 2 meters (*Nephrolepis*); terrestrial fern leaves can reach 4 m. Pteridophytes are lumped here as a group, but include 12 families. See also Field Guide #1005.



1 *Microgramma percussa*; EB



2 *Asplenium delitescens*; EB



3 *Polytaenium citrifolium*; EB



4 *Pleopeltis marginata*; BH



5 *Elaphoglossum rigidum*; EB



6 *Nephrolepis* sp.; BH



7 *Serpocaulon triseriale*; EB



8 *Microgramma lycopodioides*; EB



9 *Nephrolepis* sp.; DT



10 *Niphidium crassifolium*; EB



11 *Asplenium formosum*; DA



12 Unknown; EB

**ARACEAE** (“aroids”) are distinguished by their tightly clustered flowers and fruits on an inflorescence termed a spadix, which is subtended by a green, white, or reddish bract termed a spathe (13–15); their roots are often white and thick such as in orchids (16). The plants either form dense rosettes (17) or are high-climbing hemiepiphytes many meters long (18–20), and conspicuous especially in the lowland forests of Belize. The leaves are simple to variously divided and lack trichomes; the fruits are white or shades of red to purple (15, pp. 9, 10).



13 *Philodendron hederaceum*; EK



14 *Syngonium podophyllum*; EB



15 *Anthurium bakeri*; EB



16 *Anthurium gracile*; MP



17 *Anthurium schlechtendalii*; EB



18 *Philodendron sagittifolium*; BH



19 *Monstera acuminata*; EB



20 *Syngonium* sp.; EB



**BROMELIACEAE** (“Bromeliads”) are distinguished by usually short stems with densely overlapping leaves in rosette form (21–25). The leaves can be narrow, resembling a pine needle (21, 30), or broad and strap-shaped (22–24, 28, 32); they can have smooth margins (22, 23, 28, 32) or bear formidable spines (24), and bear very evident (25) or inconspicuous (24) scales (“plant “hairs”). Their flowers are always subtended by a “floral bract,” have three sepals, three petals, six stamens, a 3-parted ovary, one style, and three stigmas, the ovary can be fully superior to inferior (see Figure on p. 11 for an explanation of these details). Fruits are berries with embedded seeds (26) or capsules that split open to release seeds with cottony appendages (27). Plants range in size from about 10 cm to 3 m tall in flower. Most bromeliads in Belize have conspicuous inflorescences (28, 31) that may be shorter, equal to, or longer than the leaves in length, and quite a few have brightly colored flowers and bracts (25, 29–31); others have white flowers and green bracts (32). See also Field Museum Guides #'s 964, 969, 1004.



*Tillandsia filifolia*; EB



*Werauhia vittata*; MP



*Vriesea heliconioides*; EB



*Aechmea bracteata*; BH



*Tillandsia pruinosa*; DA



*Aechmea bracteata*; MP



*Catopsis sessiliflora*; EB



*Werauhia gladioliflora*; EB



*Tillandsia bulbosa*; PN



*Tillandsia schiedeana*; SC



*Tillandsia fasciculata*; BH



*Catopsis wawraeana*; DA

**CACTACEAE.** Epiphytic “cacti” are vining or sprawling, spiny, epiphytes or hemiepiphytes. They are plants where the leaves are modified into spines and the stems play the major role of photosynthesis and water storage; the stems of epiphytic species are elongate, succulent, and can be longitudinally ribbed (33, 34, 39), nearly cylindrical (35), or flat in cross section (36, 40); the spines can be well-developed (33) to small or lacking (36, 40). Most species in Belize have relatively large flowers (10–15 cm long and wide) with numerous flower parts (37, 38), and often spiny, fleshy, non-dehiscent fruits (berries; 39, 40). The common genera *Pseudorhipsalis* (41, 42) and *Rhipsalis* (43, 44) are exceptions, with pendulous, non-spiny stems and small flowers (< 1 cm long) with few flower parts (42-left, 45-left); both are epiphytic, and also have small, round, greenish or white fruits (42-right, 44-right), and lack spines (41, 42).



*Selenicereus testudo*; BH



*Selenicereus testudo*; EB



*Selenicereus* sp.; EK



*Epiphyllum oxypetalum*; EB



*Selenicereus tricae*; BH



*Hylocereus undatum*; EB



*Selenicereus tricae*; EB

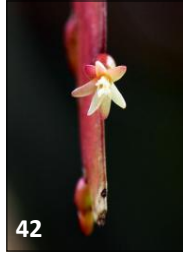


*Epiphyllum phyllanthus*; EB





*Pseudorhipsalis ramulosa*; PN



*Pseudorhipsalis ramulosa*; EB



*Rhipsalis baccifera*; AJ



*Rhipsalis baccifera*; EB

**GESNERIACEAE.** Gesneriads have opposite leaves that lack stipules (45); while the leaves are paired, they may be of different sizes (46). The stem is also succulent and usually elongated, though the species that grow as lithophytes have short stems not readily visible (47, 48). Flowers are often colored and showy; the calyx has 5 sepals, the corolla is zygomorphic, and tubular with 5 fused petals (48–50), the 4 stamens are in pairs (51, seen here with the style and stigma) with a 5th often reduced, a nectary disc is present, the ovary is 1-locular with parietal placentation, and the fruit is a capsule, berry, or berry-like capsule with a leathery texture (45, 52). See also Figure on p. 17 and Field Museum Guide #950.



*Codonanthe uleana*; EB



*Columnea purpurata*; BH



*Amalophyllon parviflora*; BH



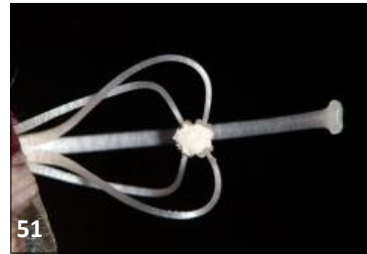
*Achimenes erecta*; MP



*Columnea sulfurea*; WC



*Alsobia baroniae*; WB



*Alsobia baroniae*; EB



*Columnea sulfurea*; BH

**ORCHIDACEAE.** Orchids are technically easy to define, but vary widely in their growth forms and morphologies, enough so that sometimes it is difficult to say if a plant is an “orchid, or not an orchid.” They are defined by having zygomorphic flowers (53), 3 petals (1 that is usually modified to form the “lip”; 53–56). The lip (or labellum) is often oriented toward the ground, but in some cases, the flower is turned around, and known as “resupinate.” There are 3 sepals, 2 of which may be fused, and the male and female organs are fused together to form a structure known as the column (56), the pollen is aggregated into a mass called the “pollinia.” The ovary is inferior, the fruit is a dehiscent capsule with numerous minute seeds (58). Vegetatively they can be tiny, only a few cm tall, or can grow to many meters long (especially *Vanilla*). Their leaves are typically succulent (59), and many genera have the stem thickened to form a water-storage organ, the pseudobulb (59). All have velamen on their roots (60).



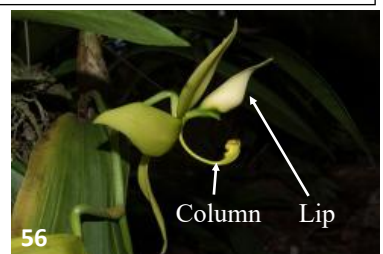
*Sobralia decora*; MP



*Galeandra arundinis*; MP



*Dichaea muricatoides*; BH



*Cynoches ventricosum*; EB



*Specklinia microphylla*; EM



*Epidendrum nocturnum*; EB



*Dinema polybulbon*; EB



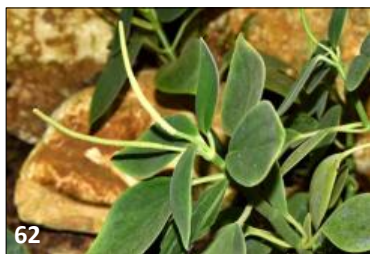
*Campylocentrum micranthum*; WC



**PIPERACEAE.** In this family, the flower and fruiting spikes are arranged as in the Araceae, on a densely flowered cylindrical spike, but these have bisexual flowers (vs. unisexual) and the inflorescence is *not* subtended by a large bract (61–63), nor do they have thick and whitish roots as seen in the Araceae. Epiphytic and lithophytic Piperaceae all belong to the genus *Peperomia* and are commonly called “peperomias” (see P. 15 for how to distinguish this genus from the second found in Belize, *Piper* and for a detailed diagram of the minute flowers). In *Peperomia*, the roots are wiry (68), and the plants are short-creeping vines (< 2 m long and typically much shorter); most species are epiphytic, but a few are terrestrial or lithophytic; the leaves are always simple and entire, always fleshy, often multi-veined from the base (64–66), and can be densely pubescent (66) to glabrous, they may be whorled (61), alternate (65), or opposite (64); the fruits are small and usually green to brownish and protrude from the spike (67); they are sticky at maturity.



61 *Peperomia deppeana*; EB



62 *Peperomia hirta*; EB



63 *Peperomia rotundifolia*; EB



64 *Peperomia pseudopereskiiifolia*; BH



65 *Peperomia alata*; BH



66 *Peperomia tuisana*; EB



67 *Peperomia obtusifolia*; WC



68 *Peperomia hirta*; EB

**A FEW UNCOMMON EPIPHYTIC PLANT FAMILIES.** In addition to the six families of flowering plants, and pteridophytes (which include 12 families), there are an additional 16 plant families that include epiphyte/lithophyte species. A few examples of these are below, but they are not commonly seen. See page 26 for a comprehensive listing of these families along with other statistics for Belize.



69 Araliaceae; *Oreopanax guatemalensis*; EB  
Large shrubby hemiepiphyte.



70 Begoniaceae; *Begonia glabra*; EB  
Climbing herbaceous epiphyte.



71 Clusiaceae; *Clusia* sp.; MP  
Hemiepiphytic shrubs or trees, latex creamy.



72 Cyclanthaceae; *Asplundia labela*; JM  
Palm-like hemiepiphyte, climbs up trunks.



73 Ericaceae; *Satoryia warszewiczii*; BH  
Large shrubby epiphyte.



74 Lycopodiaceae; *Phlegmariurus linifolius*; BH  
Pendent herbaceous epiphyte (rotated 90°).



75 Marcgraviaceae; *Marcgravia nepenthoides*; EK  
Epiphytic or hemiepiphytic lianas.



76 Melastomataceae; *Blakea cuneata*; BH  
Shrubby hemiepiphyte.



77 Psilotaceae; *Psilotum nudum*; DA  
Spore-producing pendent herb.



78 Rubiaceae; *Hillia tetrandra*; WC  
Shrubby hemiepiphyte.



79 Solanaceae; *Merinthopodium neuranthum*; PN, WC  
Shrubby hemiepiphyte, night flowers.



80 Urticaceae; *Cecropia* sp.; BH  
Shrubby hemiepiphyte on a cohune palm.



Dist. Abbreviations: Belize (B), Cayo (Ca), Corozal (Co), Orange Walk (OW), Stann Creek (SC), Toledo (T). Elevations listed are for Belize only. Photos here *not* represented by Belizean plants are identified in the text. Unless stated, notes refer to the epiphytic/lithophytic representatives of the families present in Belize, and not their terrestrial counterparts.

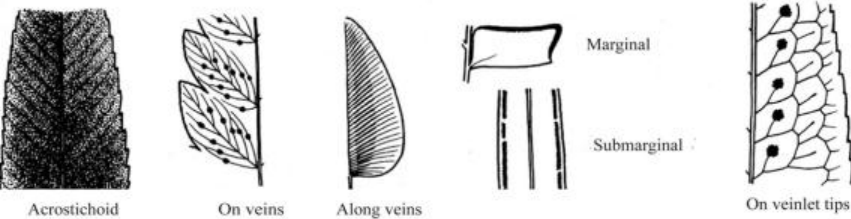
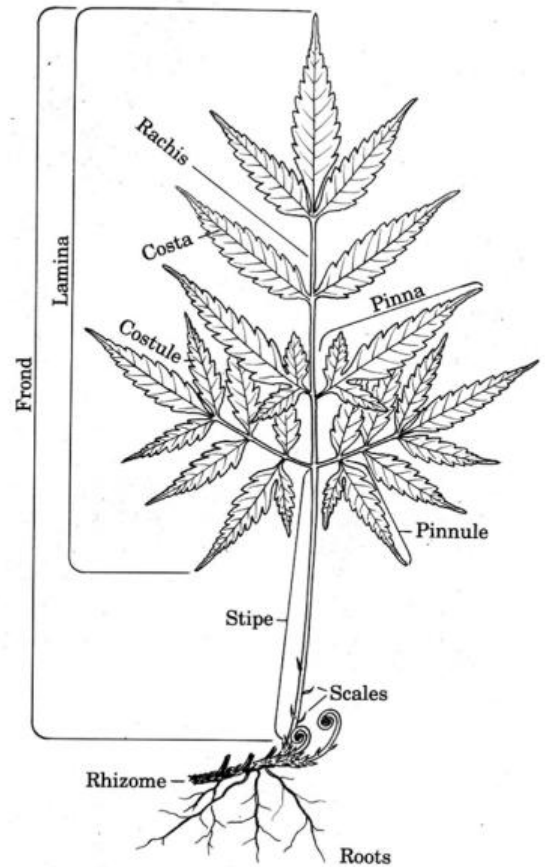
## Pteridophyta (“ferns”)

**Distinguishing Features:** The main feature is the production of spores instead of flowers and fruits. Spores are produced in microscopic spring-loaded “sporangia” and clumped together in clusters termed “sori.” The location and arrangement of the sori is key to distinguish between the genera and species. Ferns and lycophytes account for roughly 20% of the vascular epiphytic species diversity in Belize and comprise 12 distinct families.

**Distribution:** Global. Throughout Belize, in a variety of habitats including forests and forested wetlands.

**Dispersal:** Dust-like spores are wind dispersed. These spores then grow in to a photosynthetic structure that produces the sex organs. Following fertilization, a young fern leaf is created; this leaf develops and produces more spores to continue the lifecycle.

*Illustration below:* Types and arrangement of sori. *Illustration to the right:* Structure and terminology associated with fern morphology. Illustrations adapted from the *Flora of the Venezuelan Guayana*, Missouri Botanical Garden Press, St. Louis.



## Epiphyte Strategies

- Desiccation tolerance.
- Relatively small body size.
- “Birds-nest” or “trash-basket” growth form.
- Ability to grow in small pockets in leaf bases or moss-covered branches.
- Ability to survive long periods as gametophytes (first stage growth resembling a moss).



Many epiphytic fern species are tolerant of dry conditions by slowing down their metabolic processes (*Pleopeltis polypodioides*; BH)



Hemiepiphytic ferns send roots down to the forest floor from the canopy, or climb up via a vine-like habit as shown here (*Polybotrya* sp.; BH)



Creeping along tree branches in the canopy via long rhizomes is another strategy employed by epiphytic ferns (*Microgramma lycopodioides*; EK)



Basket-forming habit in which leaf litter becomes trapped and decomposes, and provides nutrients (*Niphidium crassifolium*, BH)

## • *Asplenium serratum*

Ca, OW, SC, T; 40–790 m elev.

- Plants epiphytic; rhizomes compact and covered in scales of different colors.
- Leaves simple, to more than 1 m long, with serrated margins, scales occasionally scattered on the underside at the base of the leaf, sori elongate.
- Family: Aspleniaceae



Leaves simple, with slightly serrated margins (EB)



Sori elongate, borne along veins (EB)



Characteristic birds-nest growth habit (BH)



Dense and abundant orange roots growing off the rhizome (EK)



***Microgramma lycopodioides***

- Ca, SC, T; 0–700 m elev.
- Plants epiphytic; rhizome long-creeping, thin, with reddish-brown scales.
- Leaves small, simple, glabrous, semi-dimorphic, sori round, lacking an indusium.
- Family: Polypodiaceae



Leaves simple, entire, relatively small, up to 12 cm long (EK)



Leaves semi-dimorphic, with fertile leaves slightly smaller and narrower than sterile leaves (EB)



Creeping epiphytic habit (EB)



Rhizome covered in reddish-brown scales, becoming bicolorous with age (EB)

***Nephrolepis biserrata***

- B, Ca, Co, SC, T; 5–550 m elev.
- Plants epiphytic, lithophytic, or terrestrial; rhizome stout, erect with tan to orange scales continuing to base of rachis.
- Leaves once divided, indusium circular or nearly so above round sori, leaf apex with developing bud.
- Family: Nephrolepidaceae



Leaves pubescent on underside, especially on the rachis and costae (EB)



Round indusia covering sori, very close to the margin (EB)



Large leaves found in a variety of habitats, most often on the trunks of cohune palms. Note the apical bud that continues to grow (arrow) which is characteristic of the genus (EB)

***Pleopeltis polypodioides***

- Ca, Co, SC, T; 0–1010 m elev.
- Plants epiphytic; rhizomes long creeping.
- Leaves once divided but not fully to rachis, may appear shriveled, but flush back after rain; sori round lacking an indusium, scales covering underside of leaf.
- Family: Polypodiaceae



Scales covering the leaf underside (EB)



Sori round, lacking an indusium (BH)



Epiphytic habit. May be found creeping along tree branches (EB)



Long creeping rhizome covered in tan or coppery scales (BH)

***Niphidium crassifolium***

- Ca, SC, T; 0–1000 m elev.
- Epiphytic or lithophytic; rhizome compact.
- Leaves simple, large, with rigid texture, margins entire; sori arranged in a single row between veins.
- Family: Polypodiaceae



Leaves simple, margins entire (BH)



Indusium lacking; sori round, one row per vein distinguish it from *Campylo-neurum* which has two or more (BH)



Leaves in high light turn yellow (BH)



Roots pubescent, rhizomes scaly (EB)



## Araceae (“aroids”)

**Distinguishing Features:** herbs (non-woody plants); often with aerial roots present; leaves alternate, simple, often fleshy; flowers are produced on a **spadix**, a type of inflorescence known as a spike, with tiny flowers tightly clustered together on a fleshy stem, this is often subtended and surrounded by a bract known as a **spathe**; fruits are fleshy berries.

**Distribution:** Pantropical and subtropical, and throughout Belize, in a variety of habitats including forests and wetlands.

**Pollination:** Flowers are usually insect-pollinated (often bees, beetles); some species produce heat among their inflorescences that can attract pollinators.

**Seed Dispersal:** Fleshy berries dispersed by birds, mammals, or via water.



### Epiphyte Strategies

- Leaf shape changes with level of maturity and light availability.
- Hemiepiphytic lifestyle, growing up a tree trunk and eventually reaching flowering potential.
- “Birds-nest” or “trash-basket” growth form.
- Velamen-equipped aerial roots.
- Water storage in leaves and stems.



Leaf shape changes markedly during growth, allowing plants to survive low to mid-level light. Here juvenile leaves clasp tightly to the host during the ascent to greater illumination (*Monstera* sp.; EK)



Hemiepiphytic life style in aroids begins with the plant rooting in the ground, climbing the host, and eventually losing contact with the ground; here aerial roots help attach to host (*Monstera* sp.; DA)



Rosette or “birds-nest” growth form help anthuriums and philodendrons to collect nutrient-rich falling litter (*Anthurium schlechtendalii*; BH)



Velamen, the whitish, spongy coating of the exposed roots helps to maximize absorption of moisture and nutrients (*Anthurium gracile*; EB)

### *Anthurium gracile*

- **Ca, SC, T;** 30–500 m elev.
- Wet to dry forests in Belize.
- Distinguished by its rosette growth form, leaves that are broadest above the middle, and pendent infructescences.
- Most often found growing in ant nests.



Older plants can be large and robust (BH)



Leaves are broader above the middle, and with long, slender petioles (MP)



The fruiting cluster is often pendent due to the weight of the seeds (EB)



The reddish-maroon spathe is initially erect, and begins to reflex during flowering, and eventually is sharply reflexed in fruit (EB)

### *Anthurium schlechtendalii*

- **All Districts;** 80–700 m elev.
- Humid to dry forests.
- Distinguished by its large size, rosette growth form, leaves that are broadest above the middle, and marked square petioles (leaf stalks) and midveins.



Plants can grow to 2 m wide and more than 1 m tall (BH)



Midvein on lower leaf surface is notably square in cross section (EB)



Fruits red at maturity, the heavy spike spreading or arching and the spathe reflexed (BH)



Inflorescence erect, the spadix off-white, spathe maroon (EB)



## Monstera spp.

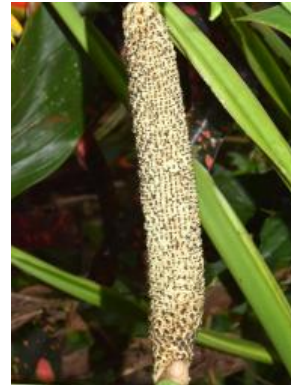
- **Ca, OW, SC, T;** 5–750 m elev.
- Nine species of the genus in Belize.
- Humid forests.
- Monsteras are usually distinguished by the holes in their leaves, but some species lack this.
- Vines can be hemiepiphytes, where the stem loses contact with the ground.



Large, climbing vines with distinctive holes in the leaves (*Monstera dissecta*; EB)



Leaves are often dissected or perforated, but one species in Belize has entire leaves (Elma Kay exhibits *Monstera acuminata*; BH)



The spathe falls off after flowering, and the fruit follow (*Monstera dissecta*; EB)



The large, white spathe is distinctive in all species, and the male and female flowers are mixed (*Monstera dissecta*; EB)

## Philodendron hederaceum

- **Ca, SC, and T;** 30–750 m elev.
- Humid forests.
- The long-pendent branches and grayish leaves help distinguish this species.
- Found growing in a variety of habitats, such as along rivers or in forests.



One of the most characteristic philodendrons in Belize, with long-pendent branches (BH)



The leaves are perfectly heart-shaped (EK)



Bronzy bract surrounds new growth, and adventitious roots are produced at the nodes (BH)



The spathe has a touch of rose-color inside at the base; female flowers are located at the base of the spadix (EK)

## Philodendron radiatum

- **B, Ca, OW, SC, T;** 0–900 m elev.
- A distinctive species in humid forest, the only philodendron in Belize with deeply split leaves.
- Found vining on the forest floor or high into the canopy; the aerial roots often reach many meters down to the forest floor.



Plants can grow to be quite large, and the mature stems are robust; note numerous aerial roots below (EB)



Plants initially grow terrestrially, but need to climb into the light for flowering to occur (BH)



Hemiepiphytic climber making its way up a tree; leaves are spaced well apart (BH)



Flowers several per branch; ones pictured here are closed, eventually spathe will open to reveal spadix (EB)

## Syngonium spp.

- **All Districts;** 0–930 m elev.
- Seven species in Belize
- Mostly humid forests.
- Syngoniums are distinguished by their multiple, palmate leaf divisions, vining/hemiepiphytic, growth, and often bright red fruits.



High-climbing vines with distinctive palmate leaflet arrangement (*Syngonium podophyllum*; BH)



The palmate shape of the leaves is helpful in distinguishing the genus (*Syngonium neglectum*; EK)



The base of the spathe remains after flowering and often turns bright red to attract seed dispersers (*Syngonium podophyllum*; BH)



The young inflorescences are surrounded by a membranous spathe (left), the upper part which falls away (*Syngonium podophyllum*; BH)



## Bromeliaceae (“bromeliads”)

**Distinguishing Features:** Herbs (non-woody plants, though some stems may harden); most often epiphytic; usually with rosette growth form of tightly clustered leaves in whorls, the leaf margins smooth to very spiny; conspicuous foliar trichomes often present; inflorescences frequently showy with colored bracts; flowers with 3 sepals, 3 petals, 6 stamens, and 3-parted ovary; fruits berries or dehiscent capsules.

**Distribution:** The largest plant family to have evolved in the Americas, of which 55% are epiphytic. Found from southern USA to Argentina; widespread in Belize where 95% of the species are epiphytic.

**Pollination:** Flowers are pollinated by humming-birds, insects, or by bats (*Werauhia*).

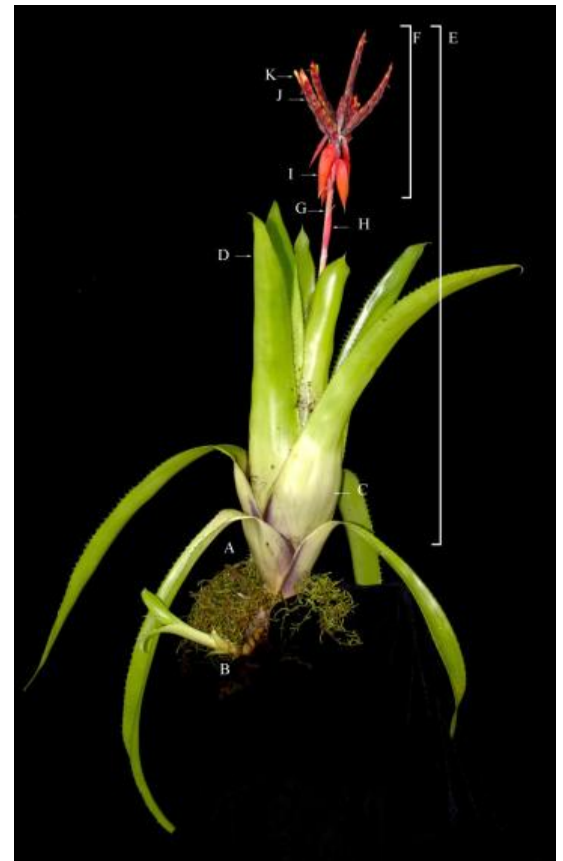
**Seed Dispersal:** Seeds are dispersed by wind or gravity in the capsular-fruited genera and by birds, mammals, and rarely insects in the fleshy-fruited ones.

Image on right

*Aechmea tillandsioides*

- A:** Habit. **B:** Ramet, often called “pup” or “offset.” **C:** Leaf sheath.
- D:** Leaf blade. **E:** Inflorescence, here compound (branched).
- F:** Flower cluster.
- G:** Scape (mostly hidden among leaves). **H:** Scape bract. **I:** Primary bract.
- J:** Floral bract. **K:** Flower, with yellow corolla evident.

Photo by Marvin Paredes



## Epiphyte Strategies

- Atmospheric lifestyle where roots function to anchor, rather than absorb water/nutrients.
- Specialized trichomes to absorb water/nutrients.
- Tank and trash-basket growth form and interaction with fauna.
- Twig epiphytism, the ability to reach seed-dispersal stage on twigs.
- Moderate succulence.
- CAM-type photosynthesis to reduce water loss.



**Bromeliads** such as *Tillandsia balbiana* (EB), pictured here on power lines in Cayo District, can thrive without leafy tanks or absorptive roots. Moisture and nutrients enter the plant via leaf-borne trichomes



**Trichomes**, “plant hairs” are scale-like epidermal appendages which allow bromeliads to absorb moisture and nutrients. Trichomes can also protect plants from herbivores and sun exposure (left, *Tillandsia pruinosa*, right, *T. brachycaulos*; EB)



**Tank-forming bromeliads** collect water and leaf litter at the bases of their overlapping leaves. These tanks provide aquatic habitat for fauna, which in turn enrich nutrient levels for the plant (*Androlepis skinneri*; EB)

## *Aechmea bracteata*

- **All Districts;** 5–880 m elev.
- Found in many forest types of Belize.
- A common and attractive bromeliad in Belize, distinguished by the urn-shaped rosette, strong and erect marginal teeth, and bright red bracts that are pendent.



The “urn-shape” growth is characteristic; leaves are broad and strap-shaped (BH)



Spines are significant and dangerous, but are not curved and do not hook flesh (BH)



Primary bracts hang down and maintain a bright color; branches are perpendicular to the axis (EB)



Mature fruits turn black; infructescence branches usually remain vibrant with red color (EB)



## *Aechmea tillandsioides*

- All Districts; 40–420 m elev.
- Humid to drier forests.
- Not only with significant spiny teeth and colorful bracts but almost always growing in hanging epiphyte gardens harboring aggressive ant colonies.



Growth habit like *A. bracteata*, but spines are fine and sharp, and inflorescences with stout, short branches (BH)



Leaf spines sharp, straight, and dark, markedly contrasting with the leaf color, which is bright green on both surfaces (EB)



Inflorescence branches flattened, simple or compound; scape and primary bracts bright red with small teeth, flowers yellow (BH; inset, flower EB)



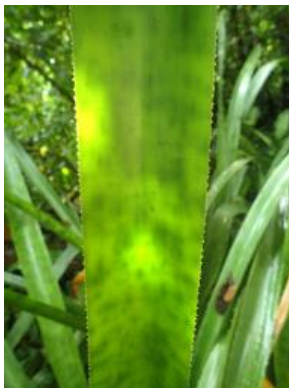
Inflorescence bracts range from pale orange to deep orange or reddish; fruits are bright blue at maturity (arrow) (EK)

## *Androlepis skinneri*

- Ca, SC, T; 10–750 m elev.
- Found in many forest types.
- Epiphyte, terrestrial, or lithophyte.
- Leaves can be colorful with orange, red, and pinkish hues, the inflorescence with shades of white and pale yellow, bracts may be light pink.



Becoming massive epiphytes, plants receiving strong sunlight take on vibrant leaf colors (EB)



Leaf spines short, sharp, and abundant, from base to tip; blades irregularly spotted (EB)



Flower cluster narrow, long, the lower portion branching; bracts pinkish; shade leaves green (EB)



Flowers are yellow and with small spines, they can be male or female; inset, fruits are white (EB)

## *Catopsis morreniana*

- Ca, OW, SC, T; 80–680 m elev.
- Common in Belize.
- Distinguished by the soft, spreading, strap-shaped leaves, powdery coating, prominent scape bracts, and erect, branched inflorescence.
- Equally at home growing on trees as on rocks; found in well-lit and ventilated areas, such as exposed limestone walls.



Plants are rather small with soft, flexible, strap-shaped leaves, and prominent scape bracts (MP)



Leaves with a waxy, powdery coating especially notable on the lower surfaces (WC)



Inflorescence erect, with ascending branches; male and female flowers on different plants (WC)



Petals scarcely exceeding the sepals, bright white (WC)

## *Catopsis sessiliflora*

- Ca, SC, T; 0–680 m elev.
- Common in citrus orchards, though rare in natural forests.
- Similar to *C. nutans*, but has branched female inflorescences (versus simple) and white petals (versus orange).
- Male and female flowers are found on different plants.



Plants have relatively few, broad, triangular leaves tapering to a point, and pendent inflorescences (MP)



Female plants have fewer, larger flowers and with inflorescences less-branched than the male plants (EB)



Plant in bud; leaves glossy above, with powdery coating on the lower surface toward the base (EB)



View of male flower with anthers releasing pollen (MP)



## *Tillandsia balbisiiana*

- All Districts; 5–550 m elev.
- Seasonally dry forests.
- Distinguished by the bulbous base, narrow, leathery, silvery green, spreading, recurved, or twisting leaves; red to orange floral bracts, and purple corollas; plants often colonized by ants.



Distinct bulbous base, leaves spreading, often twisted (EB)



Inflorescences narrow, elongate, simple, or more often compound; scape bracts leaf-like (EB)



Individual inflorescence branches are few and held erect, and are flattened (EB)



Floral bracts sometimes infused with green and red, turning green after flowering (PN)

## *Tillandsia brachycaulos*

- B, Ca, OW, T; 0–550 m elev.
- This compact species grows in large colonies in the citrus orchards.
- Distinguished by flower cluster borne among the central leaves, and vivid red to coral color bracts; compare with *T. variabilis*, which has fewer leaves.



Easily seen when in bloom, often in citrus orchards (EB)



Often all parts of the plant are colored, and fade to green after flowering (EB)



After flowering, the plants turn green, even if in full sun; brown structures are fruits (EB)



Purple flowers borne among the colorful bracts; anthers and stigma protruded (EB)

## *Tillandsia bulbosa*

- All Districts; 0–760 m elev.
- Many habitats except the wettest ones in the south.
- Distinguished by the gray, bulbous base, few cylindric, narrow leaves, bright red bracts, lavender corollas.
- Often found hanging upside down individually or in colonies, and inhabited by ants.



Plants are found growing at every angle from their host (BH)



Medusa-like growth with bright bracts and flowers (WC)



Large, bulbous base, and contrasting leaf and sheath coloration; leaves are deeply channeled (BH)



Floral bracts red; corollas purple, tubular, with protruding anthers (MP)

## *Tillandsia festucoides*

- B, Ca, OW, SC, T; 80–750 m elev.
- Often forming dense colonies.
- One of the narrowest-leaved tillandsias, distinguished by the reddish bracts, lavender/purple corollas, finely spotted leaves and floral bracts, and non-stoloniferous growth.



Leaves narrow, much shorter than inflorescences; often grows in large colonies (BH)



Many plant parts covered with fine reddish spots (EB)



Lateral inflorescence branches slender, spreading from main axis (EB)



Corolla tubular, purple with protruding flower parts (EB)



## *Tillandsia streptophylla*

- **B, Ca, Co, OW, SC, T;** 0–600 m elev.
- Common in lowlands.
- The most photographed tillandsia in Belize! A robust species, often with ants; distinguished by the large bulbous base, heavily scaly nature, twisted leaves, and multi-colored flower cluster.



Attractive epiphyte, seen here in forests of Sarstoon-Temash National Park growing with orchids and peperomias (BH)



Leaves are usually twisted and warped, channeled and heavily covered with trichomes (BH)



Plants can grow in almost any orientation; scape and primary bracts are pink to coral (EB)



As with all species in this group, corollas are purple, tubular, and with protruding flower parts (EB)

## *Tillandsia variabilis*

- **B, Ca, OW, SC, T;** 25–610 m elev.
- Found in broadleaf forests and citrus orchards.
- The relatively small size of the rosette, narrow leaves, simple or few-branched pink to red inflorescences, strongly flattened inflorescence branches, help distinguish it from other species.



Leaves are usually green in the shade, reddish in the sun; the inflorescence bracts are red during flowering (PN)



A bronzy-leaf form growing on a citrus tree (EB)



When inflorescence is branched, the branches have long, sterile axis bases (EB)



Inflorescence branches flattened laterally; corollas tubular, purple, with protruding stamens and stigma (EB)

## *Tillandsia utriculata*

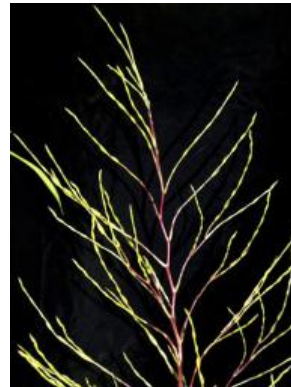
- **B, Ca, SC;** 5–130 m elev.
- Moist forests, especially common in citrus orchards.
- A large plant distinguished by a spreading rosette, by slender, straight inflorescence branches, and by white petals.
- Many seeds produced.



Leaves are stiff, light to dark green above, paler below; common in citrus orchards (EB)



Inflorescences with numerous, slender branches (EB)



Slender, straight inflorescence branches can be green or burgundy in color (EB)



Corolla tubular, twisted to one side; petals white; anthers and stigma protruding (EB)

## *Vriesea heliconioides*

- **B, Ca, OW, SC, T;** 80–700 m elev.
- Humid forests in southern Belize.
- Distinguished by the unbranched inflorescence, broadly spreading, colored bracts, and white flowers.



Plants are relatively small and found in the understory, in similar habitats as *Guzmania lingulata* (EB)



Floral bracts large and widely spreading. They can be all green to all red; flowers appear one at a time (EB)



Inflorescence unbranched, with bracts either in one plane or in whorls as pictured here (WC)



Petals bright white, with their tips spreading (EB)



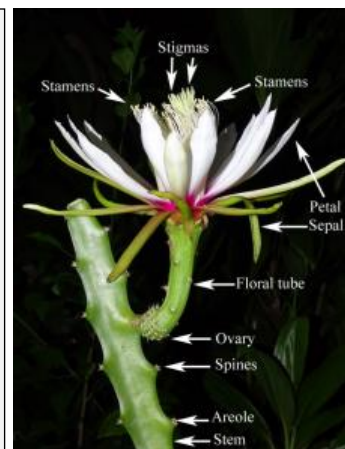
## Cactaceae (“cacti”)

**Distinguishing Features:** Vining or shrubby epiphytes or hemiepiphytes; seasonally dry to humid forests; stems succulent, photosynthetic, leaves lacking; areoles present, often with spines; flowers small to quite large, with few to more commonly numerous sepals and petals (termed “tepals” when they cannot be distinguished from one another), usually white, rarely pink; ovary inferior; fruits berries from white to bright pink.

**Distribution:** American tropics and subtropics with the highest diversity in Mexico, the southern Andes, and central-eastern Brazil; one species in Central Africa.

**Pollination:** Flowers are pollinated by birds, bats, or insects.

**Seed Dispersal:** Seeds are dispersed by birds or mammals.



### Epiphyte Strategies

- Water retention in photosynthetic stems termed “cladodes.”
- Spiny areoles for protection against herbivores.
- Adventitious roots to help climb and absorb water and nutrients.
- Animal-dispersed seeds
- CAM-type photosynthesis to reduce water loss.



Stems are succulent in all species, and can be several-angled (young *Selenicereus testudo*; EB), flattened, or nearly round in cross section.



Stems have adventitious (aerial) roots that help them climb; spines, when present, are found at nodes along the stem called areoles (*Selenicereus testudo*; MP)



A high-canopy shrubby-vining epiphyte or hemiepiphyte; flowers are often showy and large in species of *Hylocereus*, and *Selenicereus* (*Selenicereus* sp.; BH)



All cacti, as well as most shrubby epiphytes, have animal-dispersed seeds; the fruits are often colored (*Epiphyllum oxypetalum*, left BH; *Rhipsalis baccifera*, right EB)

### *Epiphyllum oxypetalum*

- Ca, SC, T; 160–760 m elev.
- Large, shrubby or climbing in humid forests of southern Belize.
- Leafy stems shiny and easily distinguished from *Epiphyllum phyllanthus* because of distinctive branching pattern.



Leafy stems are strongly flattened and succulent and have a distinctive branching pattern (EB)



The fruits are bright pink and succulent (BH)



Flowers arise along the leafy stem margins and lack spines (EB)



The flowers are large, white, and open at night (EB)

### *Epiphyllum phyllanthus*

- Ca, OW, SC, T; 60–900 m elev.
- Coarse, shrubby vine found in humid forests.
- Young growth is strongly flattened and succulent, older growth is narrow, hard, and woody.
- Flowers are large and fruits are bright pink.



Here growing among other epiphytic plants (EB)



The black seeds stand out from the whitish flesh within the bright pink berry (EB)



Flower, side view showing reflexed and spreading, multiple tepals (EG)



Flower, front view; the arrow points to the gynoecium (♀), with many stigmas (EG)



## *Pseudorhipsalis ramulosa*

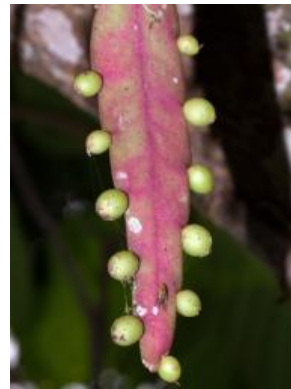
- **Ca, T;** 80–650 m elev.
- Large, shrubby epiphyte with sprawling, flattened branches.
- Stems often markedly red, both new growth and those growing in the sun.
- Flowers relatively small and with few parts.
- A newly proposed name is *Kimnachia ramulosa*.



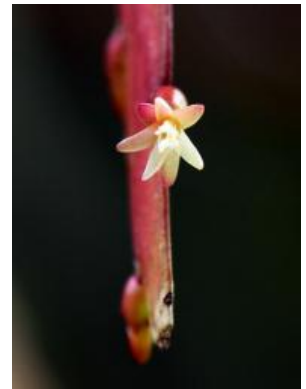
Elegant and colorful, the pendent branches are festooned with whitish fruits (BH)



New growth has a reddish tinge, and the ultimate branches are strongly flattened (BH)



Fruits are green and then turn whitish at maturity (EB)



The small, simple flowers are whitish with a reddish tinge (EB)

## *Rhipsalis baccifera*

- **Ca, SC, T;** 20–750 m elev.
- Common in humid forests of southern Belize.
- Graceful, pendent epiphyte with branches growing to several meters long.
- As with *Pseudorhipsalis*, the flowers are small and have few parts.



Branches are long-pendent, and arise from larger, and stouter branches (Angel Lara displays a branch; DP)



Fruiting branch with characteristic, long-pendent branches (EB)



Fruits are white at maturity, and abundantly produced (EB)



As in *Pseudorhipsalis ramulosa*, the flowers and fruits are small, lacking multiple parts, and non-spiny (EB)

## *Selenicereus testudo*

- **B, Ca, Co, OW;** 5–690 m elev.
- Dry forests of northern Belize.
- The contorted growth has earned this plant the common name “devil’s-gut cactus.”
- Mature stems are well-armed with stout spines.



The contorted growth and stems of varying width with strong spines are diagnostic (BH)



Young stems have soft areolar trichomes and sharply angled stems (EB)



Plants shaped like bizarre chandeliers drip from trees in Corozal (BH)



Flowers are large, and showy, with tepals grading from green to pure white (PN)

## *Selenicereus tricae*

- **Ca;** 80–250 m elev.
- Found most commonly in citrus fields.
- Large, shrubby epiphyte with sprawling, stiff, and barb-wire type branches.
- Stems triangular in cross-section
- Flowers fragrant, opening at night and fruit covered by slender spines.



Stems grow to several meters long and are rigid (Addie Worth examines a stem; EB)



Spines are present on the ovary and the stem bears stout, but short spines (EB)



The fragrant flowers have a beautiful pink tinge at the base of the petals (BH)



The fruit is markedly spiny (EB)



## Gesneriaceae (“gesneriads”)

**Distinguishing Features:** Epiphytic or lithophytic herbaceous to woody shrubs and vines; leaves opposite, simple, glabrous or pubescent, often fleshy; calyx 5-lobed, corolla tubular; fruits berries to leathery capsules.

**Distribution:** Panropical and throughout Belize except for Corozal District, in mostly humid, forested habitats. Approximately 20% of species are epiphytic. In Belize the family includes eight genera and 15 species; five are frequently founds on limestone outcrops and 10 are epiphytic. They are known from all Districts except for Corozal.

**Pollination:** Flowers are bird- or insect-pollinated and provide nectar as a reward.

**Seed Dispersal:** Fleshy berries are dispersed by birds, ants (*Codonanthopsis*), mammals, or via wind or gravity.

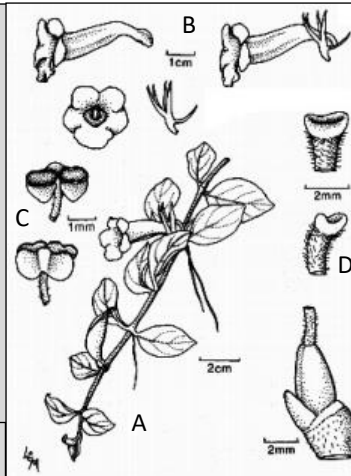


Figure to right: *Codonanthopsis elegans*. A. Habit. B. Perianth views. C. Anther views. D. Pistil views.

### Epiphyte Strategies

- Water storage in stems and leaves.
- Waxy epidermis to minimize water loss.
- Aerial roots.
- Animal pollination and seed dispersal.
- Ant-nest specialization, often found with *Aechmea tillandsioides*, *Anthurium gracile*, *Coryanthes picturata*, *Epidendrum flexuosum*.



Many epiphytic gesneriads have fleshy leaves and flowers, and a shiny, waxy epidermis to minimize water loss (*Codonanthopsis uleana*; EB)



Many epiphytic gesneriads have adventitious roots that help the plant climb and obtain water and nutrients. (*Columnea sulfurea*; MP)



The bright coloration of leaves and flowers is attractive especially to hummingbirds in search of nectar (*Columnea sulfurea*; BH)



Arboreal ants create nests and farm plants. These often include a gesneriad (*Codonanthopsis*), as well as aroids, bromeliads, and orchids (BH)

### *Codonanthopsis crassifolia*

- B, SC, T; 5–400 m elev.
- Stems pendent; leaves entire to slightly toothed.
- Corolla gradually narrowed and often yellow throated within; calyx lobes broadest at middle.
- Fruits split in half and are bright red at maturity.



Leaves entire to slightly toothed



Corolla evenly expands toward the apex, and typically very pale pink and yellowish inside; the calyx lobes are well-developed and somewhat leaf-like (EB)



Fruits are bright red and split in half at maturity (EB)

### *Codonanthopsis uleana*

- Ca, SC, T; 90–120 m elev.
- Found often in ant nests growing alongside *Aechmea tillandsioides* (Bromeliaceae) and *Anthurium gracile* or *A. scandens* (Araceae).
- Noticeable anther awns.



Habit, with simultaneous flower and fruit; leaves are succulent (EB)



Distinguished from all other species of *Codonanthopsis* in Belize by the short awns on the anthers (BH)



The calyx lobes are keeled (angled) and relatively short; the fruit lavender at maturity (EB)



## Orchidaceae (“orchids”)

**Distinguishing Features:** Epiphytic or lithophytic herbs; stems often enlarged into water-storing structures (termed pseudobulbs); roots covered with a white, water- and nutrient-absorptive sheath (termed velamen); bilaterally symmetric flowers variously shaped and highly modified for pollination by animals, sepals and petals three with one petal often larger and differently colored (termed lip); pistil and stamen combined into a columnar-shaped structure, the column; pollen grouped into waxy masses (termed pollinia).

**Distribution:** The largest plant family in the world, and in Belize; found in all continents except Antarctica, widespread in Belize and representing 43% of known epiphytes at the species level, and 50% at the genus level.

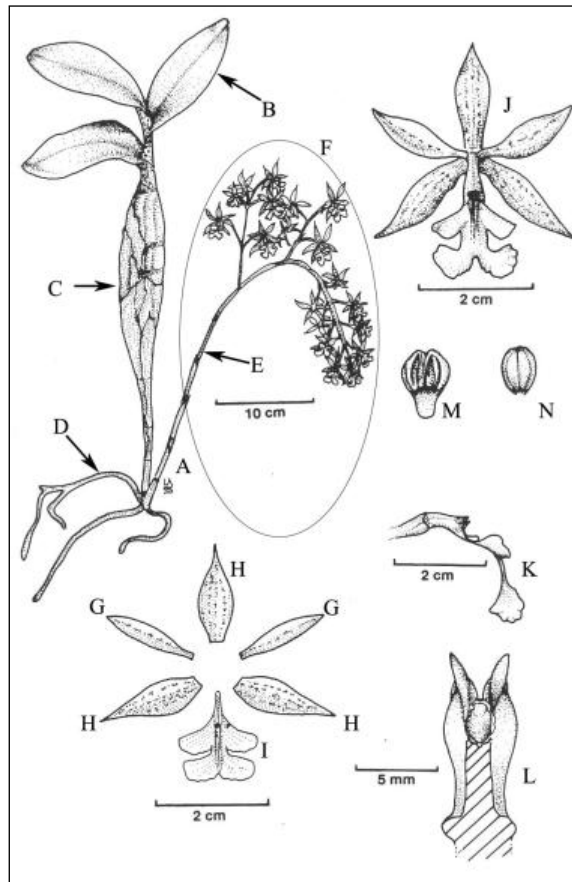
**Pollination:** Flowers are pollinated largely by insects through a variety of strategies including tricks and rewards.

**Seed Dispersal:** The dust-like seeds are dispersed by wind.

Illustration on right

*Epidendrum stamfordianum*

- A: Habit. B: Leaf.
- C: Pseudobulb.
- D: Root. E: Peduncle.
- F: Inflorescence.
- G: Petals. H: Sepals.
- I: Lip. J: Flower.
- K: Lateral view of lip.
- L: Column (Formed from the fusion of male and female reproductive parts). M: Anther.
- N: Pollinia (Waxy aggregation of pollen grains)



### Epiphyte Strategies

- Water storage and desiccation tolerance
- Velamen-equipped adventitious roots
- Wide variety of insect pollination syndromes
- Trash-basket growth form
- Twig epiphytism, the ability to reach seed-bearing age quickly
- Numerous, minute, wind-borne seeds
- CAM-type photosynthesis to reduce water loss



Epiphytic orchids have pseudobulbs (thickened stems for water storage) of varying sizes and shapes, and a thick, waxy leaf epidermis to resist desiccation (*Encyclia alata*, EB)



Orchid roots are covered in velamen, a covering of white spongy cells that rapidly absorb water when available (*Cynoches ventricosum*, EB)



For pollination, orchids use scent, mate mimicry, food reward, and other strategies to lure insects to carry the sticky pollinia (aggregated pollen) to another flower (*Coryanthes picturata*, EB)



In some species, trash-basket root growth helps to trap detritus in the tree canopy and provide nutrients and moisture (*Gongora leucocheila*, EB)

### *Anathallis lewisiae*

- Ca, OW, SC and T; 120–370 m. elev.
- Found in moist forests.
- Very small epiphyte.
- Distinguished by matt-forming habit with rhizomes and leaves appressed to host tree.



Plants become matt-forming with age; stems arise from rhizomes (BH)



Leaves small (< 1.5 cm long), oval; appressed to host tree; upper surface warty in texture (WC)



Rhizome internodes short, branching extensively; young leaves emerge from sheaths (MP)



Flowers > 7 mm long; sepals orange; petals purple; lip purple, with triangular lobes on either side; unscented (WC)



## *Catasetum integerrimum*

- **B, Ca, Co, OW, and T;** 5–570 m elev.
- Large, clumping orchid.
- Numerous old pseudobulbs often present on mature plants.
- Distinctive flowers with an inflated, sac-like lip
- Dioecious-separate male and female plants.



Leaves plicate (folded like a fan). Inflorescence from the base of the pseudobulb (EB)



Root mat dense, often growing upward. Old pseudobulbs covered in papery, spine-tipped leaf bases (EB)



Female flowers greenish-yellow with sepals and petals spreading outward (EB)



Male flowers with sepals and petals turned in, sepals curved up at the tip, often with purple spotting (EB)

## *Christensonella uncata*

- **B, Ca, OW, SC, and T;** 10–750 m elev.
- Small, clumping orchid.
- Leaves linear, somewhat keeled, one leaf per stem.
- Distinctive brown sheath at base of leaves.
- Flowers a combination of white, yellow, brown, and purple.



Small, clump-forming orchid (EB)



Stems becoming pendent with age; covered with overlapping brown sheaths (EB)



Leaves thick; stems with small pseudobulbs; inflorescence from behind a small bract at leaf base (EB)



Flowers solitary; sepals and petals white with purplish veins, angled forward; lip white; unscented (WC)

## *Cohniella ascendens*

- **All Districts;** 10–620 m elev.
- Plants tufted, with leaves arising from a single point.
- Characterized by long, linear leaves that are rounded.
- Inflorescence showy.



Leaves are long and rounded with a single groove running the length; leaves erect or pendent (EB)



A small pseudobulb is at the base of each leaf, often concealed by a sheath (EB)



The inflorescence forms at the base of the pseudobulb; pendent; flowers numerous and showy (DA)



Sepals and petals yellow with red-brown spots; lip is bright yellow with multiple lobes; unscented (EB)

## *Encyclia bractescens*

- **All Districts;** 5–250 m elev.
- Distinguished by ovoid-conical pseudobulbs with one to three linear leaves.
- Inflorescences prolific with showy purple-pink-brown flowers.



Medium-sized tufted orchid that forms large clumps with age. Leaves from the top of the pseudobulbs are linear, rigid, up to 26 cm long (EB)



Pseudobulbs covered in a thin sheath when young; often wrinkled during drought (EB)



Sepals and petals similar; purple-veined lip may curl at edges and appear triangular (EB)



## *Encyclia guatemalensis*

- **B, Ca, Co, OW, and SC;** 0–200 m. elev.
- Medium to large clumping orchid.
- One of several *Encyclia* species with large pseudobulbs and long, thick leaves that can be hard to distinguish when not flowering.



Leaves long and linear with a leathery texture; dark green to purple; pseudobulbs large, conical (BH)



Pseudobulbs on mature plants may be wrinkled from desiccation (EB)



Inflorescence terminal, to 1 m long. Multi-flowered with sepals and petals suffused with purple striping (EB)



The similar *Encyclia alata*, pictured above, is distinguished by wider leaves and longer sepals and raised, purplish-red to yellow veins on the lip (EB)

## *Epidendrum nocturnum*

- **All Districts;** 5–690 m elev.
- Large, clump-forming orchid.
- Large, solitary flowers.
- Reed-like stems or “canes” that lack pseudobulbs.



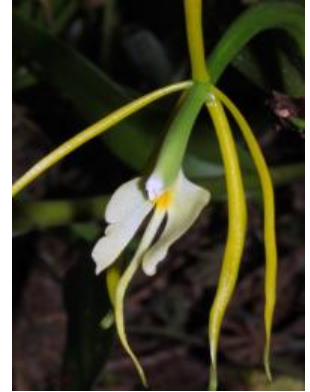
Plants tufted with reed-like stems up to 60 cm long; leaves alternate, distichous; erect or pendent (EB)



Stem distinctly flattened; covered in overlapping leaf sheaths that may turn brown with age (EB)



Inflorescence of one to several flowers; terminal; may be found on old, leafless stems (MP)



Sepals and petals similar; long and linear; yellowish; lip white and 3-lobed; strongly scented (EB)

## *Lophiaris lurida*

- **Ca, OW, SC, and T;** 20–710 m elev.
- Large, clump-forming orchid.
- Pseudobulbs small, obscured by papery sheaths.
- Often referred to as a “mule-ear” orchid due to the broad leaf shape.



Leaves elliptic, leathery, and rigid; often suffused with purple (EB)



Inflorescence erect, branched, often over 1 m long; flowers many (EB)



Sepals and lateral petals similar, with wavy edges; lip 3-lobed separated by a claw-like structure (EB)



The similar *Lophiaris oerstedii* has smaller flowers blotched with red-brown or magenta (EB)

## *Myrmecophila tibicinis*

- **B, Co, and T;** 0–20 m elev.
- Forms very large clumps with age.
- Is a myrmecophyte, often forming association with ants.
- The genus means ant-loving; from the Greek myrmeco, “ant” and phileo, “to love.”



Pseudobulbs large, to 35 cm long 4 cm wide, ridged outwardly, with hollow chambers inside; topped with two to three stiff, leathery leaves. Inflorescence to 2.5 m long with flowers clustered toward the end (EB)



Cross-section of pseudobulb showing hollow chambers that are often occupied by ants (WC)



Flowers showy, variously colored with red, purple, pink, and yellow (EB)



## *Oncidium* *sphacelatum*

- **B, Ca, OW, SC, and T;** 5–140 m elev.
- Plants often exhibit trash-basket growth form with age due to aggregation of old pseudobulbs and prolific root growth.
- Inflorescences often numerous and very showy.



Plants may form very large clumps with age. Leaves somewhat stiff and erect; from base and top of pseudobulbs. Inflorescences long and pendent; multi-branched; arising from base of pseudobulb; flowers numerous, showy (EK)



Pseudobulbs long and flattened, somewhat wider at the base; roots thin and numerous (EB)



Sepals and petals yellow with reddish-brown spotting; lip wide at the base; margin wavy (EB)

## *Prosthechea* *cochleata*

- **Ca, OW, SC and T;** 30–610 m elev.
- Flowers with distinctive cockleshell-shaped lip.
- Found in moist, broad-leaved forests.
- National flower of Belize, known as the black orchid.



Plants may appear clumped, but have short rhizomes (EK)



Leaves and inflorescence grow from the top of the pseudobulbs; leaves flexuous (EB)



Pseudobulbs short-stalked, pear-shaped and somewhat flattened (EB)



Flowers with cockleshell-shaped lip uppermost on the flower; sepals and petals reflexed downward (EB)

## *Specklinia* *grobyi*

- **All Districts;** 0–320 m elev.
- Diminutive orchid, forming small clumps with age.
- Flowers with distinctive shape of an open bird's beak.



Plants small, tufted (EB)



Inflorescence from the base of the leaf; peduncle thin; multi-flowered (EK)



Leaves solitary, spatula-shaped; often with purple spots or coloration on the underside (EB)



The two lateral sepals are fused, forming a single structure below the minute lip; petals tiny (EB)

## *Trigonidium* *egertonianum*

- **All Districts;** 15–720 m elev.
- Robust, clump forming orchid.
- Old peduncles often remain on the plant.
- Flowers have a distinctive cup-like shape.



Plants tufted; can form large clumps with age; leaves two per pseudobulb, up to 45 cm long (EK)



Inflorescences from between the brown papery sheaths of the pseudobulbs (EB)



Sepals partially fused, forming a cup; lateral sepals strongly recurved (EB)



Petals tiny (tipped with purple); lip and column shorter than the petals, all within the sepal "tube" (EB)



# Common Epiphytes and Lithophytes of Belize

More orchids. The images on this page demonstrate the flower diversity of those genera not represented in the “common orchids,” on pages 17–20), but which are known from at least three Districts.



*Acianthera hondurensis*; EB



*Brassavola grandiflora*; WC



*Brassia caudata*; EB



*Camaridium acutum*; BH



*Caularthron bilamellatum*; DA



*Chysis bractescens*; WC



*Coryanthes picturata*; EB



*Dichaea panamensis*; PG



*Dimerandra emarginata*; EB



*Epidendrum flexuosum*; SC



*Erycina pusilla*; EB



*Gongora leucocheila*; EB



*Ionopsis utricularioides*; DA



*Isochilus carnosiflorus* (rotated 90°); EB



*Macradenia brassavolae* (rotated 90°); EB



*Masdevallia floribunda*; WC



*Maxilariella variabilis*; EB



*Mormolyca hedvigiae*; MP



*Notylia barkeri* (rotated 90°); EB



*Ornithocephalus inflexus*; PG



*Platystele stenostachya*; WC



*Ponera striata*; PN



*Scaphyglottis behrii*; EB



*Sobralia fragrans*; BH



*Stanhopea ecornuta*; MP



*Stelis gracilis*; EB



*Trichosalpinx blaisdellii*; WC



*Vanilla hartii*; BH



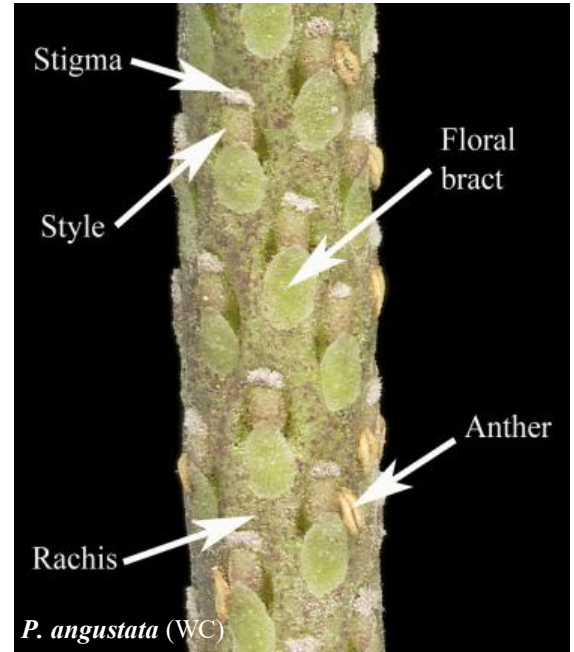
## Piperaceae (genus *Peperomia*)

**Distinguishing Features:** Leaves simple, usually fleshy and arranged opposite, alternate, or whorled on the stem. Inflorescence of tiny, non-descript flowers lacking sepals or petals, imbedded in a thickened stalk or rachis; can be single or compound and found on the terminal end of stems, in leaf axils or opposite the leaves. Each flower has a single stigma and 2 anthers covered by a small roundish floral bract.

**Distribution:** Pantropical to subtropical; found in all districts of Belize with known diversity highest in Toledo, Stann Creek, and Belize Districts; found in broad-leaved forests and swamps.

**Pollination:** Flowers pollinated by hoverflies (Syrphidae), wind and autogamy (self-pollination).

**Seed Dispersal:** Seeds dispersed by bats, ants, and likely birds and other mammals, due to fruit with hooked rostrum and/or sticky glands.



There are two genera of Piperaceae in Belize. The genus *Piper* is common throughout the country, but is always terrestrial, with alternate, membranaceous leaves, 2–5 stigmas, and is usually woody. *Peperomia*, which is included here, can be terrestrial, lithophytic, or is often epiphytic. It is distinguished by alternate, opposite, or whorled leaves, and stems, that are frequently succulent and 1 stigma.

Figure, right: Habit of small, creeping *Peperomia rotundifolia* (EB)



### Epiphyte Strategies

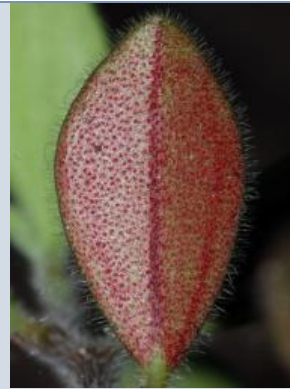
- Adventitious roots.
- Semi-succulent leaves and stems store water.
- Pubescence deflects sunlight, traps water from dew, and may deter herbivory.
- Sticky fruit with hooked rostrum aid in seed dispersal.
- Mixed photosynthetic syndromes using a combination of CAM and C3.



Adventitious roots (roots growing from stems) allow stems to elongate and hold fast to rocks and bark of host plants (*P. portobellensis*, EB)



Thickened leaves and stems provide storage for water. Leaves with a thickened or waxy epidermis resist water loss (*P. angustata*, WC)



*Peperomias* are variously pubescent to hispid on leaves, stems, and inflorescence parts (*P. tuisana*, EB)



Fruits are covered with sticky glands; many species have a hooked rostrum formed from the remnant style (*P. maculosa*, WC)

### *Peperomia claytonioides*

- **Ca, T;** 150–220 m elev.
- Lithophyte or epiphyte.
- Characterized by leaves arising from a corm and multi-branched inflorescences.
- Found in shallow pockets of soil on limestone rock.



Plants often appear clump-forming as leaves are all basal (arising from a single point vs. growing along a stem) with long petioles (BH)



Leaves are rounded to obtuse (slightly pointed) at the apex and rounded to cordate (heart-shaped) at the base; veins impressed; glands lacking (BH)



Leaves have peltate (center of leaf) attachment and arise from an underground corm. Leaf underside is translucent whitish in color (BH)



Inflorescences are branched and whitish. Flowers are spread along the branches; fruits brown, lacking a rostrum, (EB)



## *Peperomia hirta*

- Ca, SC, T; 80–750 m elev.
- Epiphyte or lithophyte.
- Plants densely pubescent; leaves rounded at the base with pointed apex.
- Primarily on limestone rock and in pockets of hummus or volcanic soils.



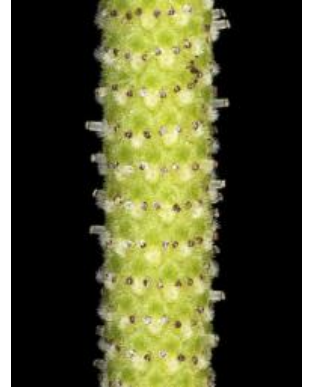
Stems often erect but can become pendent with age. (MP)



Plant densely pubescent. Upper leaf surface dark yellow-green, lower surface light green. (EB)



Inflorescence solitary, and simple; may be terminal or in leaf axils. (DA)



Floral bracts fimbriate (hair-like growth on margins); filaments elongate at anthesis then become sessile. (WC)

## *Peperomia portobellensis*

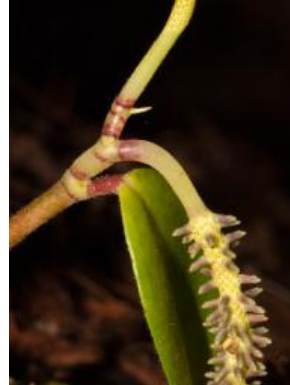
- B, Ca, OW, SC, T; 5–950m elev.
- Epiphyte or lithophyte
- Characterized by alternate, waxy leaves and columnar fruit.
- Primarily on trees or rocks in broad-leaved forests; may be associated with ant nests.



Stems elongate and rooted or long pendent. Growth pattern often zig-zag. (EB)



Leaves elliptic with obvious venation, waxy cuticle; fairly evenly spaced on stem. (MP)



Stem nodes may have red banding; stems and petioles may be glabrous to finely pubescent. (EB)



Mature fruit cylindrical and densely covered with mucilaginous glands. (EB)

## *Peperomia obtusifolia*

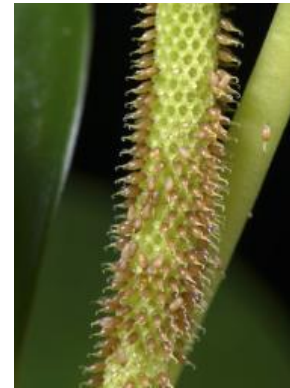
- B, Ca, OW, SC, T; 10–800 m elev.
- Epiphyte or lithophyte.
- Characterized by large, alternate, spatula shaped leaves on branching, elongate stems.
- May form large plants.
- Primarily on trees or rocks, or fallen logs.



Stems are elongate, sometimes reddish. Inflorescences terminal or axillary, simple or compound. (BH)



Leaves are thickened, with waxy cuticle; usually wider above the middle, narrow at the base. (EB)



Fruit are dense on the rachis, rounded, with a thin apical rostrum that is strongly curved. (WC)



Peduncle with very small spiculate-like projections. These are lacking in the similar *P. magnoliifolia*. (WC)

## *Peperomia tuisana*

- Ca, SC, T; 100–200 m. elev.
- Epiphyte or lithophyte.
- Stems usually erect and densely hairy.
- Inflorescence solitary; terminal or in leaf axils.
- Stems and leaf underside often red.
- Primarily on trees, rocks or fallen logs.



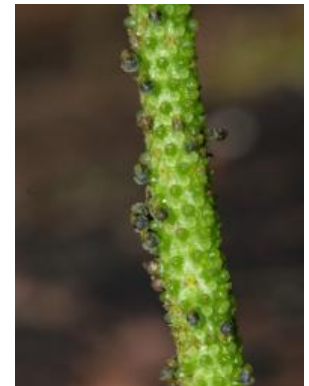
Typically upright habit of the stems. Stems may become pendent as they elongate with age. (BH)



Leaves alternate, occasionally whorled; short-petiolate to subsessile; upper veins often recessed. (EB)



Stem and underside of leaves often reddish in bright light; plants lack the red coloration in low light. (EB)



Rachis glabrous; fruit small and rounded, lacking hooked rostrum, with dense mucilaginous glands. (EB)



## GLOSSARY

**Adventitious:** Typically used to describe roots that arise from non-root tissue such as stems; these roots allow epiphytes to hold fast to their host substrate and gather water and nutrients wherever they are available; may also be referred to as “aerial” roots.

**Anther:** The structure within a flower that produces pollen; typically found as an expanded structure at the top of the filament; the anther and filament together form the stamen or male part of the flower.

**Ant nest garden:** Mutualistic association between arboreal (tree dwelling) ants and epiphytic plants whereby the ants build the garden structure (carton) in a tree, then epiphytic plants colonize the carton either from seeds being brought in by the ants or by opportunity. The result is a “garden” of epiphytes growing from the carton that appears as an enlargement on tree branches.

**Areole:** Structure on the stem or “cladode” of members of the Cactaceae that bear the spines and lateral buds.

**Awn:** A bristle-like appendage, often at the tip of another structure.

**Calyx:** The collective term for all the sepals of a flower.

**Column:** A specialized flower structure in members of the Orchidaceae; formed from the fusion of the male and female structures; contains the pollinia (aggregated pollen structures) and stigmatic surface (female pollen recipient area).

**Corolla:** The collective term for all the petals of a flower.

**Deciduous:** Plants that seasonally lose their leaves.

**Dehiscent:** Opening spontaneously when ripe, splitting.

**Desiccation:** Drying out or losing moisture; many epiphytes have the ability to tolerate periods of desiccation.

**Dimorphic:** Having two different forms; in some ferns non-fertile leaves may have a different size and shape from fertile leaves.

**Epidermis:** The outermost cell layer of a non-woody plant; i.e., the “skin” of a leaf.

**Filament:** The usually slender stalk that supports the anther.

**Floral bract:** A modified leaf subtending a flower, which can be longer than, and sometimes obscure the calyx from view.

**Flower:** The flower consists of the calyx, corolla, androecium (or stamen; male part of the flower), and the gynoecium (or pistil; female part of the flower).

**Flower cluster:** The portion of the inflorescence consisting of the flowering region, includes the associated primary and floral bracts, the axes, and the flowers themselves.

**Frond:** Fern leaf; includes stipe (stem) and lamina (leafy portion).

**Glabrous:** Without trichomes.

**Habit:** General shape and growth form of a plant.

**Hispid:** With firm, stiff hairs; feels rough to the touch.

**Humus epiphyte:** An epiphyte that roots on and grows to maturity on suspended humus (decaying plant material).

**Indusium:** In a fern, the thin structure that covers the sorus.

**Inferior ovary:** An ovary that is located below the point where sepals and petals are attached. Compare to superior ovary.

**Inflorescence:** The flowering portion of the plant, which consists of the scape and flower cluster.

**Infructescence:** The fruiting portion of the plant, which consists of the scape and fruiting cluster.

**Lateral:** Borne on the side.

**Leaf:** The vegetative portion of the plant, including the narrow “leaf stalk” or petiole and the broad blade, or lamina.

**Lepidote:** Covered with small, scurfy scales (trichomes); found on Bromeliaceae.

**Lip (also “labellum”):** The highly modified third petal of an orchid flower that often serves as an attractant to pollinators.

**Mucilaginous:** Moist and slimy; often sticky.

**Ovary:** The base of the pistil (female flower structure) that swells following fertilization to form a fruit.

**Peduncle:** Stem of a flower or inflorescence.

**Pendent:** Hanging or drooping downward.

**Perianth:** The calyx and corolla combined.

**Pistil:** The female part of the flower, with ovary, style, and stigma.

**Primary bract:** The modified leaf at the base of an inflorescence branch of Bromeliaceae; it can be colorful and large, or small and green.

**Pseudobulb:** A bulbous thickening of the stem of many epiphytic orchids; compare to a true bulb which is an underground bud.

**Rachis:** The main axis of a structure such as a leaf, frond, or inflorescence.

**Rhizome:** A horizontal stem.

**Rostrum:** A beak-like structure, such as in *Peperomia*.

**Scale:** (see “Trichome” below).

**Scape:** The stalk that connects the vegetative portion of the plant to the flower cluster in the Bromeliaceae; the scape may be short and hidden among the leaves and bracts (e.g., *Bromelia karatas*), or elongate and evident (e.g., *Aechmea bracteata*). Note, the term “peduncle” is used for the same structure in many other plant families.

**Scape bract:** The modified leaf borne along the nodes of the scape that can be from scale-like to leaf-like in appearance.

**Sepals:** Outer structures of a flower; often green and leaf like but may be colorful and difficult to distinguish from the petals as in the Orchidaceae; typically protects the flower bud before it opens; collectively called the calyx.

**Sheath:** A structure that surrounds another structure; in epiphytes it may be a leaf base that surrounds other leaf bases (Bromeliaceae) or a modified leaf that encloses a pseudobulb or pre-emergent inflorescence (Orchidaceae).

**Sorus (plural: sori):** In a fern, a cluster of sporangia on the surface of a frond.

**Spadix:** Flower-bearing structure of members of the Araceae family; typically spike-like, fleshy, and bearing numerous flowers.

**Spathes:** A bract that subtends the spadix (inflorescence) of members of the Araceae family.

**Spike:** Unbranched inflorescence with sessile flowers, typical of Araceae and Piperaceae.

**Sporangia:** In a fern, the small structure that contains spores.

**Spore:** The reproductive unit of a fern; compare to seeds of a flowering plant.

**Sprawling:** Bending or curving growth and/or laying on something else for support.

**Stamen:** The male part of a flower, consisting of filament and anther.

**Stigma:** The structure within a flower that receives the pollen; often at the top of the style; the style and stigma together form the pistil or female part of the flower.

**Style:** The structure within a flower that supports the stigma and connects it to the ovary; may be highly modified on specialized flowers like those of the Orchidaceae.

**Superior ovary:** An ovary that is located above the point where sepals and petals are attached. Compare to inferior ovary.

**Photosynthesis:** The process of plants producing food by converting water and carbon dioxide to sugars in the presence of sunlight.

**Pubescent:** Covered with short, soft hairs.

**Tepal:** A segment of the perianth (whorls of sepals and petals) that is not differentiated into a sepal or petal; i.e. The “petals” of epiphytic Cactaceae are undifferentiated so they are referred to as “tepals”.

**Trichome:** Structures analogous to plant “hairs.” Often scale-like and with an elegant “mosaic-window” appearance in bromeliads and ferns. In bromeliads they can help the movement of water and nutrients into the plant, as well as help regulate water loss.

**Trunk epiphyte:** Epiphytes that grow and reach maturity only or predominantly on the main trunk or large branches of trees.

**Twig epiphyte:** Epiphytes that grow and reach maturity only or predominantly on small twigs.

**Vascular plants:** Plants that contain structures (xylem for water and phloem for food) that conduct water and minerals throughout the plant. Mosses are examples of non-vascular plants.

**Velamen:** The thick, white spongy layer found on the outside of some epiphytic roots; function to regulate water availability to roots.

**Zygomorphy:** Where only one side of the flower mirrors the other.



**Overview:** Ian Anderson’s Caves Branch Botanical Garden, Marie Selby Botanical Gardens, and many partners conducted an extensive literature, herbarium, and field inventory to document the epiphytes and lithophytes of Belize during 2014–2019. Sites visited included the geographical extremes of the country and areas previously poorly or incompletely known. As a result, we have increased the number of these plants known in Belize from approximately 400 species (recognized in the year 2000 Checklist of the Vascular Plants of Belize) to 656, an increase of 60%. We now recognize 34 plant families, 183 genera, and 656 species of vascular epiphytes, hemiepiphytes, and lithophytes in Belize.

**Table 1.** The 34 vascular epiphytic, hemiepiphytic, and lithophytic plant families known to date in Belize.

	No. Genera	No. Species	Plant group
Anemiaceae	1	1	Pterid
Araceae	6	45	Monocot
Araliaceae	1	2	Eudicot
Asparagaceae	1	1	Monocot
Aspleniaceae	1	18	Pterid
Asteraceae	2	2	Eudicot
Begoniaceae	1	5	Eudicot
Blechnaceae	1	2	Pterid
Bromeliaceae	12	67	Monocot
Cactaceae	7	12	Eudicot
Clusiaceae	1	12	Eudicot
Cyclanthaceae	1	2	Monocot
Dryopteridaceae	4	19	Pterid
Ericaceae	4	6	Eudicot
Gesneriaceae	6	12	Eudicot
Hymenophyllaceae	2	27	Pterid
Lentibulariaceae	1	1	Eudicot
Lomariopsidaceae	1	2	Pterid
Lycopodiaceae	1	5	Lyco
Marcgraviaceae	3	8	Eudicot
Melastomataceae	2	4	Eudicot
Moraceae	1	18	Eudicot
Nephrolepidaceae	1	7	Pterid
Oleandraceae	1	1	Pterid
Ophioglossaceae	1	1	Pterid
Orchidaceae	90	280	Monocot
Piperaceae	1	34	Magnol
Polypodiaceae	14	42	Pterid
Psilotaceae	1	1	Pterid
Pteridaceae	7	9	Pterid
Rubiaceae	2	4	Eudicot
Schlegeliaceae	1	1	Eudicot
Solanaceae	2	2	Eudicot
Urticaceae	2	3	Eudicot
<b>TOTAL</b>	<b>183</b>	<b>656</b>	

**Table 2.** Vascular plant families with more than 10 species of epiphytes and lithophytes represented in the country.

	No. Genera	No. Species	Plant group
Orchidaceae	90	280	Monocot
Bromeliaceae	12	67	Monocot
Araceae	6	45	Monocot
Polypodiaceae	14	42	Pterid
Piperaceae	1	34	Magnol
Hymenophyllaceae	2	27	Monocot
Dryopteridaceae	4	19	Pterid
Aspleniaceae	1	18	Pterid
Moraceae	1	18	Eudicot
Cactaceae	7	13	Eudicot
Clusiaceae	1	12	Eudicot
Gesneriaceae	6	12	Eudicot

**Table 3.** Taxonomic diversity among five major evolutionary plant groups, the seed-bearing Angiospermae, including the Magnoliidae (Piperaceae), Eudicotyledonae (many families), and Monocotyledonae (many), and the spore-bearing Pteridophyta (many) and Lycophyta (Lycopodiaceae). The epiphytic/lithophytic taxa are overwhelmingly represented by epiphytes at the species and genus levels by the Monocotyledonae.

	No. Families	No. Genera	No. Species
Monocotyledonae	5	110	395
Pteridophyta	12	35	130
Eudicotyledonae	15	37	127
Magnoliidae	1	1	34
Lycophyta	1	1	5

**Acknowledgments:** While the institutions listed on the first page provided the means and logistics to carry out this project, dozens of staff members and volunteers contributed above and beyond in many ways to support the work, such as participation on expeditions, assisting with plant identification, processing specimens, and photography. Their contributions are greatly appreciated.

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- Checklist of the Vascular Plants of Belize* by Michael J. Balick, Michael H. Nee, Daniel E. Atha. New York Botanical Garden Press
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- Native Orchids of Belize* by Ian McLeish, B.R. Adams, N.R. Pearce, J.S. Briggs. A.A. Balkema, Netherlands, USA,

**Additional Resources:** The reader can find additional resources relating to the flora and fauna of many tropical regions of the world at: <https://fieldguides.fieldmuseum.org>