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SYSTEMATICS OF PHYLLUM BRYOPHYTA 2

Class: *Oedopodiopsida*

The striking resemblance of the morphology of *Oedopodiopsida*'s sporophyte and gametophyte to other species, in different classes, has caused incorrect classification. For instance, *Oedipodium* has a sporangial neck having a hypophysis, similar to species of Splachnaceae. Due to this commonality, *Oedipodium* has been placed in Splachnaceae in the past, however it's correct classification is in *Oedopdiaceae*.

The family Oedopodiaceae has leaves that are clustered in rosettes close to the stem base. Leaves typically have one costa. The leaf cells have small corner thickenings. Stems are erect. Commonly, asexual reproduction occurs by disk shaped bodies that may be located on protonema and among the sexual organs embedded in rosettes of leaves.

Class: *Polytrichopsida*

Mosses in the class Polytrichopsida are often considered as pioneer plants. Species in this class are acrocarpous and can be found on acidic, exposed and nutrient-poor soils, all the while exhibiting a wide distribution. Not only are the leaves of this class costate, but they also possess photosynthetic lamellae, a complex and unique leaf structure belonging to Polytrichopsida. The lamellae are vertical tiers of cells present on the surface of the leaf. T hese structures are beneficial for many reason, one of them being it increases photosynthetic tissue. Furthermore, the air spaces created between the lamellae allow for gas exchange while the waxy cuticle covering the upper cells prevent water from flooding the air pockets. However, it is worth mentioning that although it functions in aiding gas exchange, the small spaces between the lamellae also function to retain moisture, allowing some species to survive in dry habitats. In some species, the lamina is incurved, thereby enclosing much of the lamellae. The variations in the height, number and morphology of the lamellae as well as the morphology of the lamina are often used as key characteristics to distinguish between species. Other characteristics of leaves also includes the presence/absence of hairpoints and colour.

The vascularization in Polytrichopsida is well developed such that hydroids (water conducting cells; in the center) and leptoids (sugar conducting cells; external to the hydroids), as well as cortical cells are present in the stem, which may be key in allowing some species in this class to be quite large (relatively). Note the leaf trace visible in this stem cross section.

In many *Polytrichum* species, the antheridia (as seen in this picture) are housed in a rosette of leaves, functioning as a splash cup mechanism. Furthermore, the paraphyses can be uniseriate in some species, while they can be biseriate in others. When mature, the sperm can be dispersed with the aid of raindrops, hopefully being splashed onto a female plant where the sperm can swim towards the archegonia

After fertilization occurs, the sporophytic tissues develop forming a foot, a long seta, and the sporangium. The sporangium continues to develop within the calyptra. In the case of some species, the calyptra is hairy, which is why the mosses in this class have earned the nickname "hairy cap mosses". Spores are the result of meiosis within the sporogenous tissue that surrounds the columella within the sporangium. In Polytrichopsida, the peristome is nematodontous. The teeth are composed of entire cells rather than fragments (as seen In Bryopsida). These teeth, which exhibit less movement than the hygroscopic arthrodontous teeth, are attached to a disk-shaped epiphragm, which develops from the extension of the columella Once the operculum is shed, the spores are released through the small openings between the teeth. These openings prevent all the spores from being dispersed at once, thereby prolonging the dispersal time and maximizing the chances spores of being released in optimum conditions.

Class: *Tetraphidopsida*

The mosses in the class Tetraphidopsida are commonly referred to as nematondontous mosses, or as having “unjointed teeth”. The species in this class have four peristome teeth that are composed of whole cells, unlike the arthrodontous mosses which have teeth composed of cell wall fragments.The plants in this class are acrocarpous and small in size.

The highly branched, uniseriate, and green filamentous protonemal stage of these species is attached to the substrate by rhizoids. Furthermore, protonemal flaps, which are rich in chloroplasts, develop from the protonema in some species. These flaps, although small, can be seen standing erect and growing on decaying wood in shaded areas. From the base of these protonemal flaps, gemmiferous shoots can develop, such as in *Tetraphis pellucida*. These shoots play a significant role in asexual reproduction. At the tip of these shoots is where there are cup-shaped whorls of leaves that house gemmae. This morphological structure functions as a splash-cup mechanism.

As previously mentioned, the sporangium has four peristome teeth that are made of entire cells. The nematodontous teeth may not move as much as the hygroscopic arthrodontous teeth, however there can still be movement that aid in the release and dispersal of the spores. Furthermore, the long twisted seta of some species (as seen in the picture below) can also aid in dispersing spores. By twisting in response to moisture change, this hygroscopic reaction causes the seta to untwist, thereby resulting in the movement of the sporangium.

Class: Bryopsida

Mosses in the Class Bryopsida are commonly known as the “joint-toothed” or “arthrodontous” mosses. The Bryopsids display an diverse assortment of species.

The gametophytic generation demonstrates many commonalities, however there is considerable variety. Gametophores arise from extensive and uniseriate protonema. A gametophore may be diocous or monocious, acrocarpous or pleurocarpous, highly branched, and with variable sized plants. Macroscopically, the leaves are sessile and spirally arranged in more than three rows. Further characterization of leaves includes a unistratose lamina that generally lacks lamellae and has elongate cells with numerous chloroplasts. Leaves usually contain a costa, that may or may not be mutlistratose with conducting cells. The stem lacks a leptome, thus may not contain a well developed conducting system. The rhizoids of Bryopsids are uniseriate, multicellular with oblique crosswalls when mature, and arise from epidermal cells of stems and leaves. Asexual gemmae arise from rhizoids or the gametophore, depending on the species. Sexual reproductive structures (archegonium and antheridium) are associated with sterile paraphyses. The calyptra is usually smooth and at the apex of the mature sporangium.

The sporophytic generation aids in further classification of the Bryopsids. The seta is commonly rigid, long, and persistent with a cuticle and well-developed conducting system. The sporagium develops after elongation of the seta. The sporangial jacket often contains stomata. Dehiscence of spores occurs via release of the operculum. Release of the operculum can be aided by a hygroscopically unravelling annulus. Once the operculum is released, the underlying peristome teeth are revealed. The teeth contain an endostome and an exostome, and the teeth are composed of cell fragments, giving the class its common name. The spores are unicellular, produced in synchrony, and surround the columella.

REFERENCES

1. Url1. https://blogs.ubc.ca/biology"Introduction to Bryophytes"