LAB #4 – NEMATODONTOUS MOSSES

Nematodonts have multicellular teeth. Like the teeth of the arthrodonts they are dead at maturity, but do not exhibit the same range of movement. The first lineage of nematodonts we will examine are the four-toothed Tetraphidopsids.

Terminology:

epiphragm

gemmiferous shoots

guide cells

hydroids

hydrome

lamella

leptoids

protonemal flaps (or protonematal)

sporangial jacket

sporogenous layer

LAB #4A - CLASS TETRAPHIDOPSIDA

Class Tetraphidopsida
http://blogs.ubc.ca/biology321/?page_id=68

1. *Tetraphis pellucida* (Fig. 4-1)
http://blogs.ubc.ca/biology321/?page_id=1843

At first glance the lab material for this lab may seem meager; it is definitely far from it! Each pair of students gets to examine a tray of treasure.

Three types of samples are provided for you to identify the key features of *Tetraphis pellucida* as well as understand the ecology of this very interesting moss:

(a) Decaying wood with gemmiferous shoots (and protonematal stages)

(b) Immature Sporophytes

(c) Mature Sporophytes (collected last year and dried)

Look carefully through the material with the dissecting scope. Distinguish between *Tetraphis pellucida* and the other organisms present. Depending on your sample these could include mosses we have already seen (*Hypnum circinale* and *Rhizomnium glabrescens*), *Dicranum tauricum* (used by some in the tissue culture project), liverworts *(Lepidozia reptans* and *Calypogeia muelleriana*, see Figs. 4-2 and 4-3) and lichens. Material of mosses and liverwworts are available on the side bench for comparison). **First**, do the lab activities that pertain to *Tetraphis*. Once you have finished that you can investigate the other organisms more thoroughly.

(a) Decaying wood with protonematal stages and gemmiferous shoots:

Examine a piece of decayed wood on the stage of the dissecting microscope. Look for small green elliptic or circular structures, called **protonematal flaps**; they are erect from the surface of the wood (if your sample doesn't have any check with another lab group). The protonematal flaps are more obvious than filamentous protonema, but you may be able to see those too. Place several of flaps in a drop of water on a microscope slide. Spread the material apart and add a cover slip. Examine with the highest power of the dissecting microscope, then with the low power of the compound microscope. Note that the flap is unistratose, and arises from a uniseriate protonema that has uniseriate rhizoids. The cells of the flap are rich with chloroplasts. At the base of some of the flaps, young leafy gametophores (gemmiferous shoots) may be developing. **SKETCH**.

Find a mature gemmiferous shoot. The shoot is terminated with a whorl of leaves (cup shaped) in which you will find gemmae. Place some gemmae onto a slide in a drop of water and examine with the compound microscope. **SKETCH.**

Make a slide of the leaves of the gemmiferous shoot and compare the leaves surrounding the gemmae with those lower on the branch. **SKETCH** the two types of leaves.

In what other organisms have you observed splash cup mechanisms (think about examples from other courses)?

Not all gemmiferous shoots have leaves encircling the gemmae (see demonstration). These are just called “stalked gemmiferous shoots” and occur frequently on vertically oriented substrates. What is the adaptive advantage of the two types of gemmae-bearing structures?
Hint: It is a principle we discussed on the fieldtrip when considering sperm dispersal of *Plagiomnium* (splashcup perigonium) and *Porella* (epiphyte).

b) Material with Immature Sporophytes

Examine an immature sporophyte of *Tetraphis pellucida* with an intact calyptra. Remove the calyptra and examine the operculum at the tip of a developing sporophyte. Compare with Fig. 4-1.

Place a gametophore on a microscope slide. Use the dissecting microscope to observe the rhizoids at the base of the gametophore, the costate, radially arranged leaves, the elongate leaves of the perichaetium and the long seta terminated by an elongate sporangium. Make a slide of vegetative and perichaetial leaves. **SKETCH.** Compare and contrast these leaves with those of the gemmiferous shoot.

c) Mature Sporophytes

Examine a mature sporangium. It has 4 peristome teeth (see Fig. 4-1). Using a razor blade, remove the tip of the sporangium and place it onto a slide. Add a drop of water and tease the teeth apart. Add a cover slip. Examine with the compound microscope. Note that the peristome teeth are made up of many elongate cells and are several cells thick (they are not composed of cell wall fragments).

d) Complete the Comparison Chart (page 41) – some terms may be unfamiliar to you (such as epiphragm).....you will learn about these in Lab 4B.

e) Other organisms:

A number of bryophytes are commonly intermixed with *Tetraphis*:

Hypnum circinale (moss) – already on the "Bryos to Know" list
http://blogs.ubc.ca/biology321/?page_id=968

Rhizomnium glabrescens (moss) – already on the "Bryos to Know" list
http://blogs.ubc.ca/biology321/?page_id=514

Dicranum tauricum (moss) – on the "Bryos to Know" list as of now ;-)
http://blogs.ubc.ca/biology321/?page_id=987

Lepidozia reptans (liverwort, Fig. 4-2, pg. 7) – already on the "Bryos to Know" list
http://blogs.ubc.ca/biology321/?page_id=2306

Calypogeia muelleriana (liverwort, Fig. 4-3, pg. 7)
http://blogs.ubc.ca/biology321/?page_id=2310

Cladonia (lichen) - What are lichens?

f) Succession on a Stump – (potential midterm question)
Read pages 168 and 174-175 in your text (Vanderpoorten and Goffinet), lab activities, and lecture notes. Explain how the life history characteristics of *Tetraphis pellucida* organism both restrict and facilitate colonization.

Fig. 4-1 *Tetraphis pellucida* (also illustrating the bent seta of *Tetraphis geniculata*)

Tetraphis geniculata
http://blogs.ubc.ca/biology321/?page_id=4900

Tetraphis geniculate is identical to *T. pellucida* save for features of the sporophyte; it has a papillose, geniculate (bent) seta. It is not very common so keep your eyes peeled for it in the field!

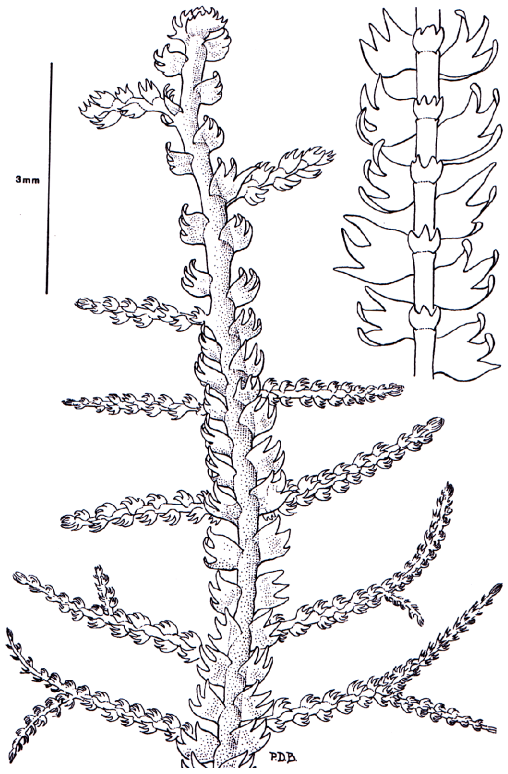

Fig. 4-2 *Lepidozia reptans* – a leafy liverwort

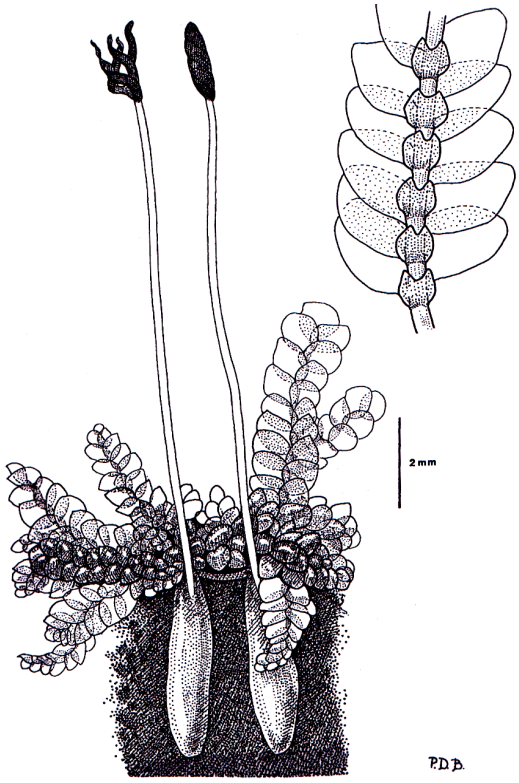

Fig. 4-3 *Calypogeia muelleriana* – a leafy liverwort

COMPARISON CHART:
BRYOPSID AND TETRAPHIDOPSID MOSSES

FEATURE:	BRYOPSIDA	*TETRAPHIDOPSIDA*
GAMETOPHYTIC:		
Protonema	*uniseriate: chloronema and caulonema*	
Rhizoids	*uniseriate, branched, oblique cross walls*	
Leaves:		
thickness	*lamina unistratose*	
shape	*unlobed blade, variable,*	
costa	+ / -	
pored leaf cells	-	
cell wall pigment	-	
Stem:		
hydroids	+ / -	
leptoids	-	
stereids	+ / -	
Pseudopodium	-	
Gemmae	+ / - *variable in size and shape*	
Calyptra	*Usually smooth, variously shaped*	
SPOROPHYTIC:		
Seta:		
hydroids	+ / -	+
leptoids	+ / -	-
Sporangium:		
annulus	+ / -	-
operculum	+	
epiphragm	-	-
columella	*cylindric*	*cylindric*
air chambers	+ / -	-
peristome teeth	*arthrodontous*	
Spore dispersal	*Dispersed over time, dispersal aided by movement of hygroscopic peristome teeth*	
Notes		