

# Fern Anatomy and Monitoring

## Goal:

To be able to describe the progression of the die off.

## Activities:

Rhizome Structure Study and Comparisons

Monitoring of Individual Ferns

## Some Fern Facts and Terms

reports here: [davidperasso.net/dieOff.html](http://davidperasso.net/dieOff.html)



# Typical Mature Fern Cycle

This applies to ferns that have been in the ground 10+ years.

## **End winter - early spring**

Last year's fronds vary from pristine to completely gone.

The crown has balled up croziers ready to expand in the spring.  
firm, green, covered with soft brown scales

## **March- April**

Balled up croziers expand into new fronds  
New fronds light green, soft

## **End of May**

Fronds from balled up croziers are fully expanded  
Yellow sori formed on fronds greater than about 12" (this varies a lot).  
Previous year fronds -  
can still be green and healthy looking but are often declining.  
New fronds darkening, hardening, but still soft.

# Typical Mature Fern Cycle (2)

## Summer

Previous year fronds mostly die

This year fronds may sustain damage, but most are healthy thru summer (in PNW)

Very wide range of non-die off damage and abnormalities possible

More fronds will emerge from time to time

Sori ripen (brown) with indusium

dehisc in late summer

At some point fern builds croziers for next spring.

## Fall

Set of croziers for next year is complete

more fronds may sustain damage, more may die back

## Winter

dormant

fronds often get beaten down

\*\* A sword fern is **not** in trouble just because it lost all it's fronds during the summer.

\*\* A sword fern **IS** in trouble if new croziers do not form and emerge in the spring.

# Monitoring

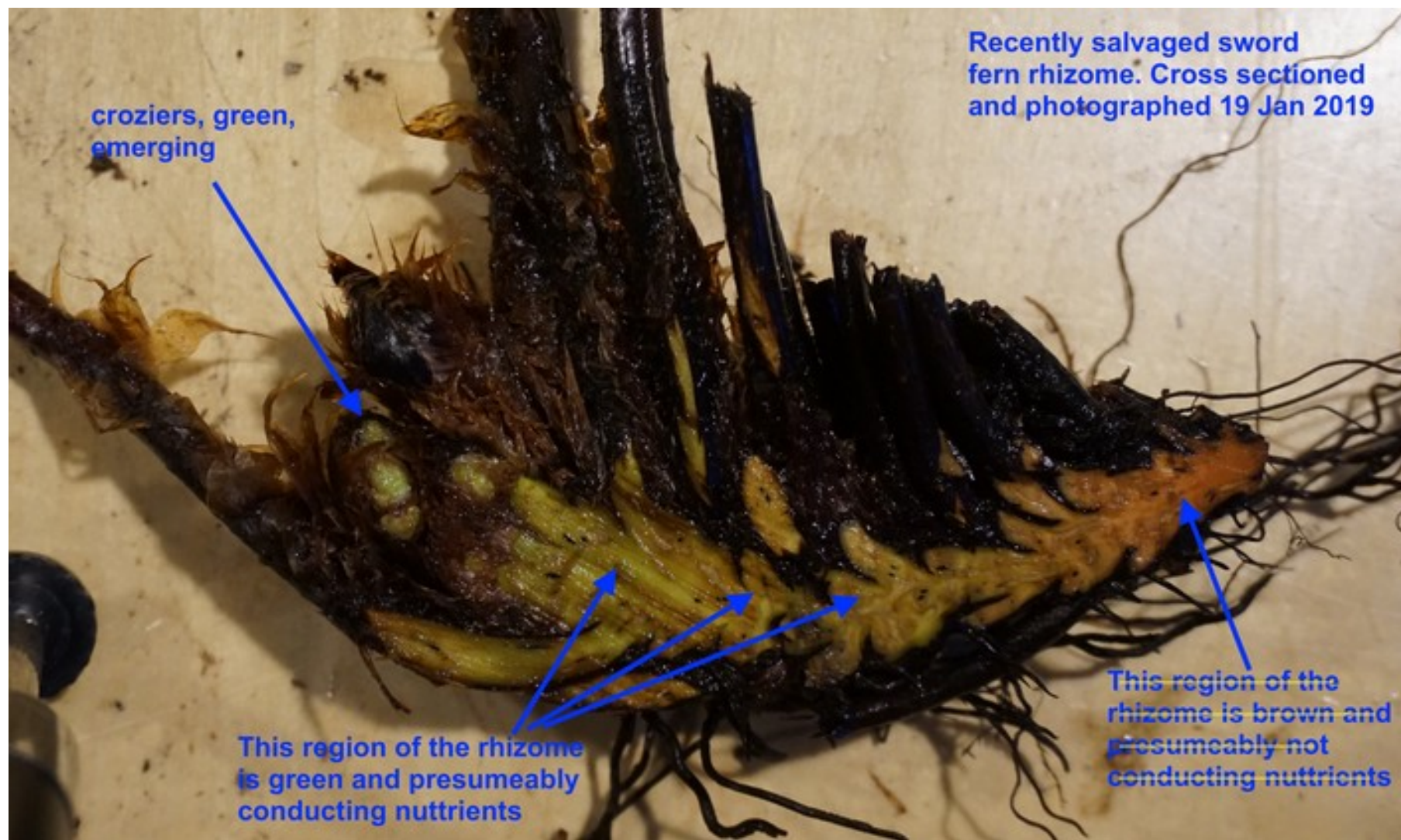
Began: March 2019

Noted so far:

- **No or few croziers expanding or deformed croziers in spring**
  - Also noted at Cougar Mountain and Sandy Hook
  - Noted by Catherine Alexander some years ago (per Paul Talbert)
  - Unknown in healthy ferns
  - Highly likely to be a die off symptom
  - **Possible that summer frond decline precedes this symptom.**
    - fronds look sufficient but not great
- **Twisted new fronds**
  - Observed only in die off area (limited search)
  - Within "normal" for sword ferns
  - Not yet observed in other die off areas
  - Worth noting, but **unlikely that this is a symptom of the die off.**

Recommendation to anyone who wants to:

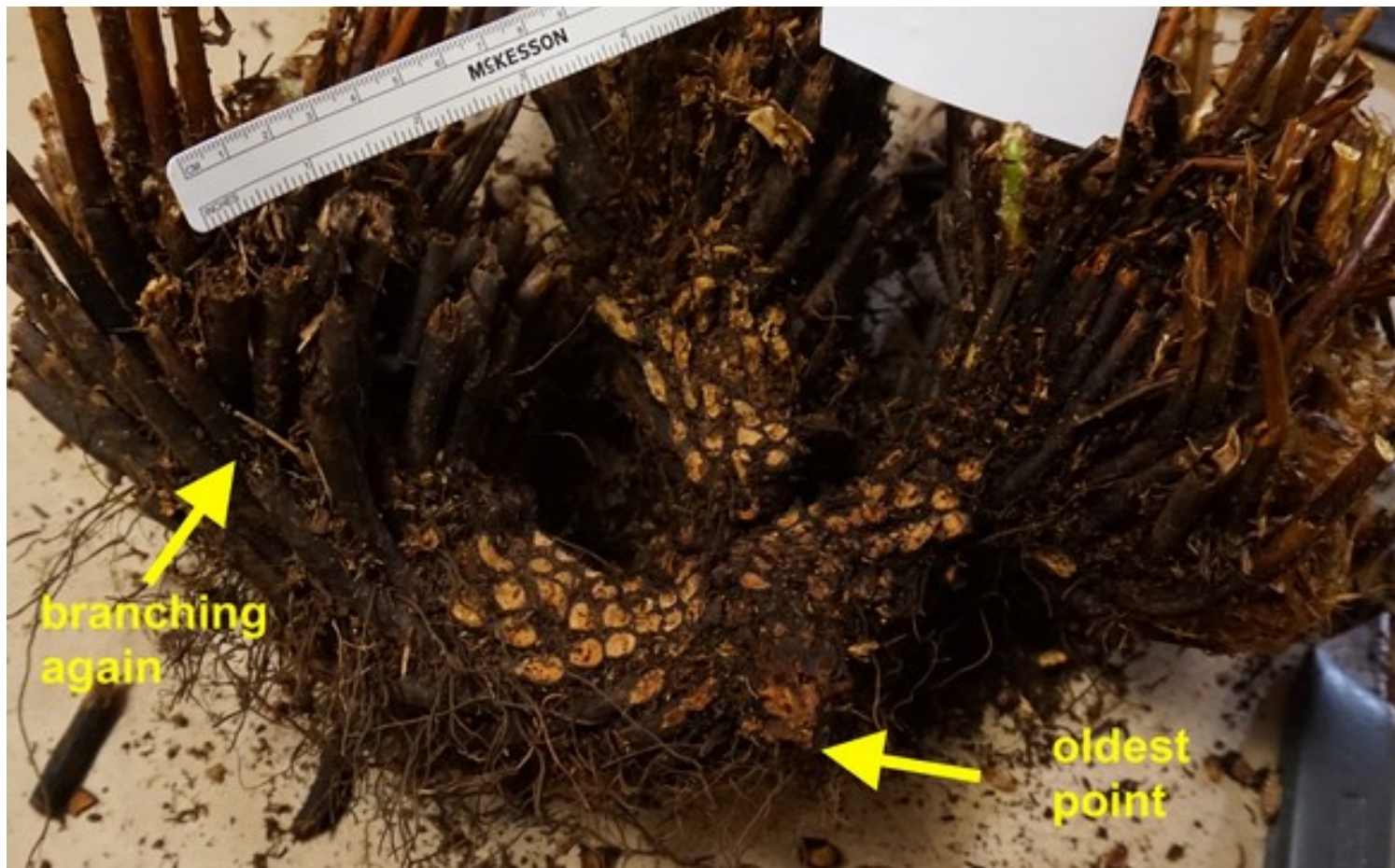
Find some individual ferns (healthy and infected) and watch them closely.  
count new fronds, track changes - colors, shape  
look for sori  
look for new croziers forming  
No observation too trivial at this point



Rhizome Cross Section Study at [davidperasso.net/dieOff.html](http://davidperasso.net/dieOff.html)

Presentation at Sword Fern Working Group Meeting, 3 June 2019. David Perasso





- Rhizome porous, vascular system runs thru "brown" as well as green areas.
- It takes 5-10 years from spore to rhizome lengthening
- A fern can live forever and branch into a multi-crowned group
- Dividing is a common horticulture practice





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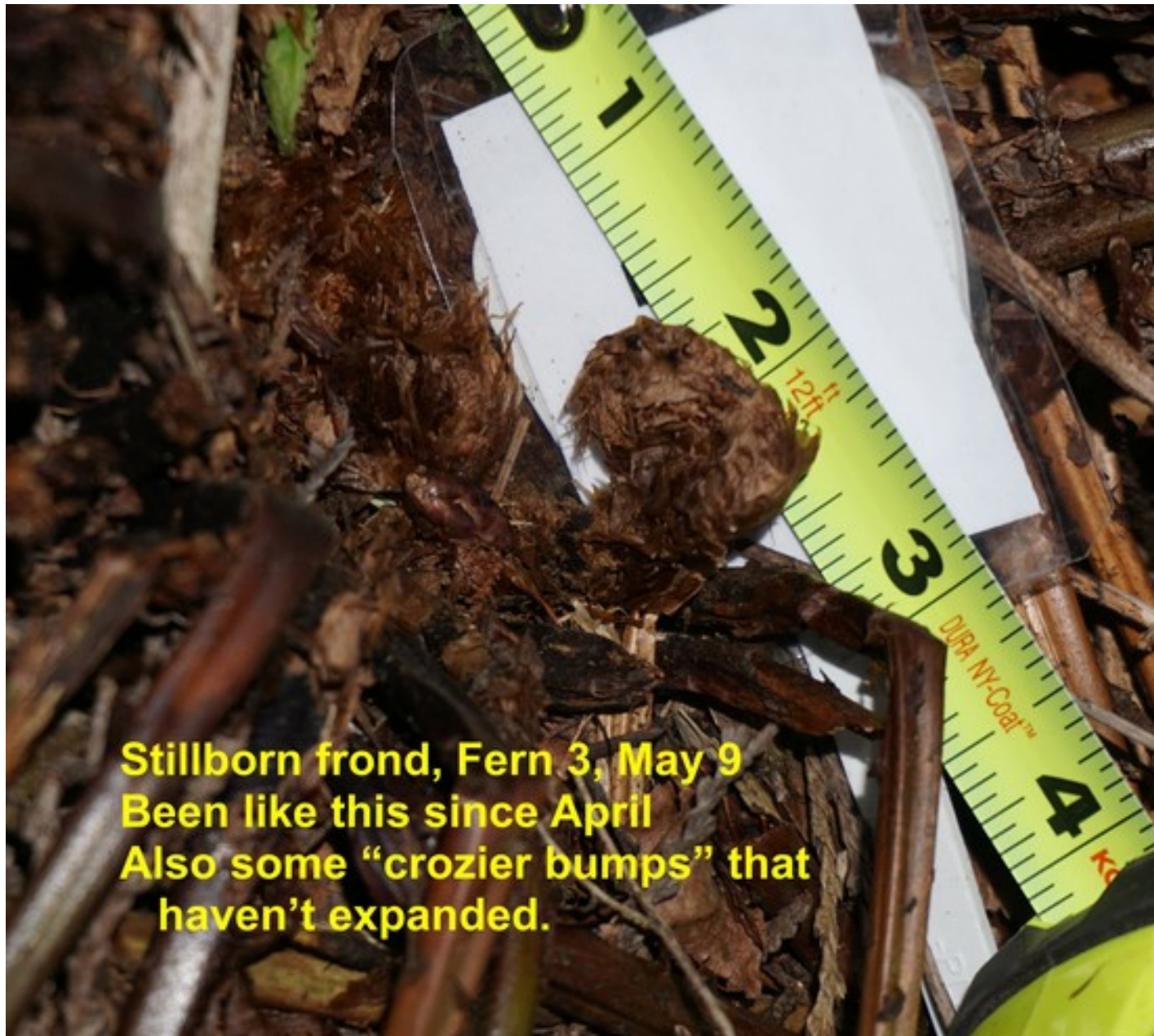
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## Fern 1A

unlikely to be a symptom as there are many possible causes and this is within what is seen on "normal" ferns.

but keep an eye out for similar fronds.



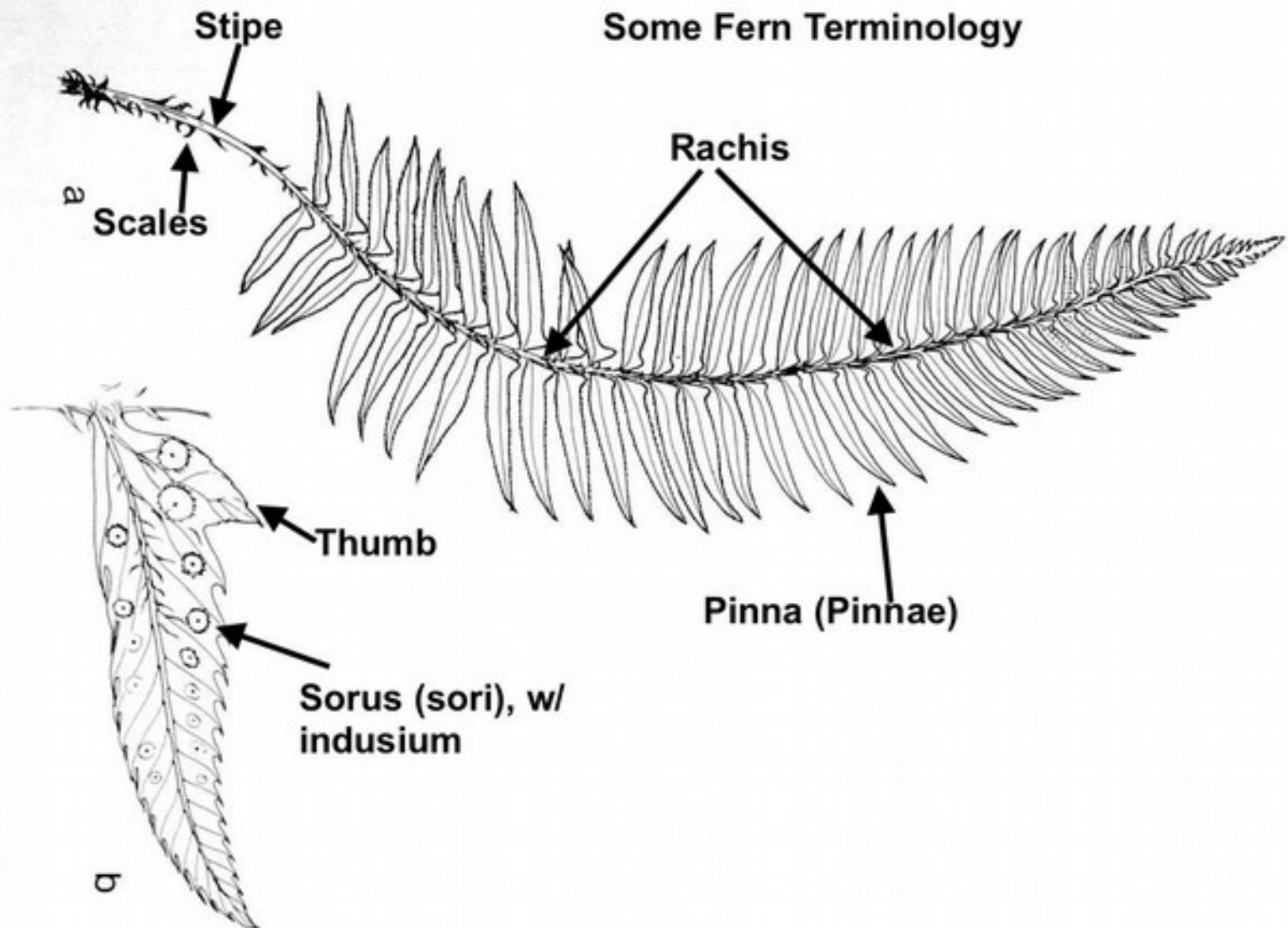




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**Fig. 105** *Polystichum munitum*; (a) frond, 1/2 x; (b) fertile pinna, 3 x.



Brokaw's Law:

"Identical biological systems, under completely controlled, perfectly identical conditions will do what they damn well please".

Dr. Charles Brokaw, Professor Emeritus, Caltech