HOW TO COLLECT FERN SPORES

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Presented by

The American Fern Society

The American Fern Society
Outreach Program

sponsors this presentation to provide information on how to collect fern spores. It is hoped that this tutorial will encourage viewers to collect quality spores for themselves and others as a source to grow new ferns.

CONTENTS

ABOUT FERN SPORES

Spores, like seeds, are used to grow new plants. Even if you do not grow ferns from spores, collecting them will give you the pleasure of knowing you are helping other gardeners or botanists. You may also be safeguarding the survival of rare or endangered species, or adding brand new species to cultivation.

Spores are abundant but very inconspicuous.

- On the back of this tree fern leaf are clusters of spore cases containing spores.
- Below, a closer view shows the clusters of spore cases as brown round dots.
- The individual spores and spore cases are too small to be seen in this view.

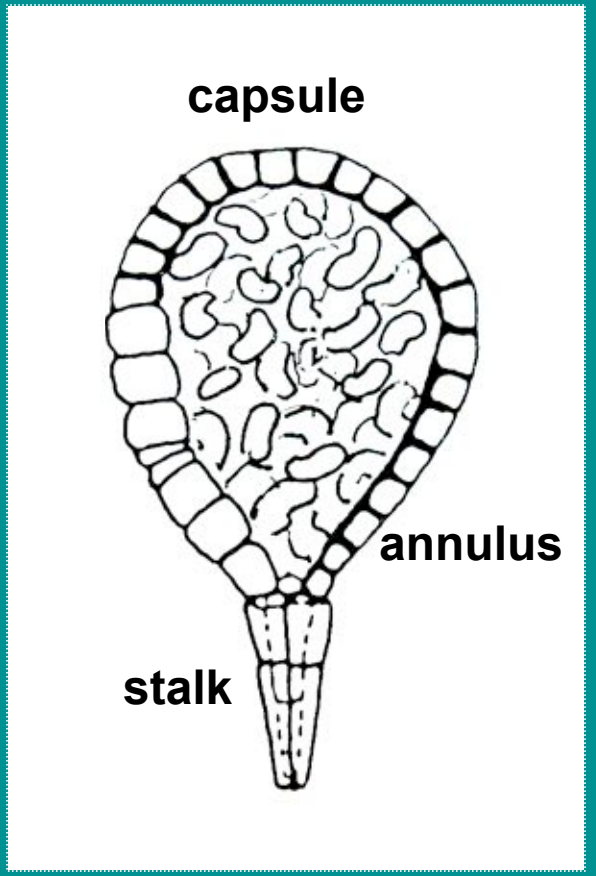
Sphaeropteris cooperi

Spores versus Seeds
Both are reproductive bodies

- These sketches of fern spores are greatly magnified, by about 1000x.
- Spores vary in size, shape, color, and surface patterns, and have only one set of chromosomes.
- A spore is a one-celled simple structure, and only about 1/500th of an inch in diameter.
- Seeds are produced by pines and their relatives, and plants with flowers.
- Seeds have many cells, they are complex and larger than spores. They contain an embryo, ample stored food, and two sets of chromosomes.

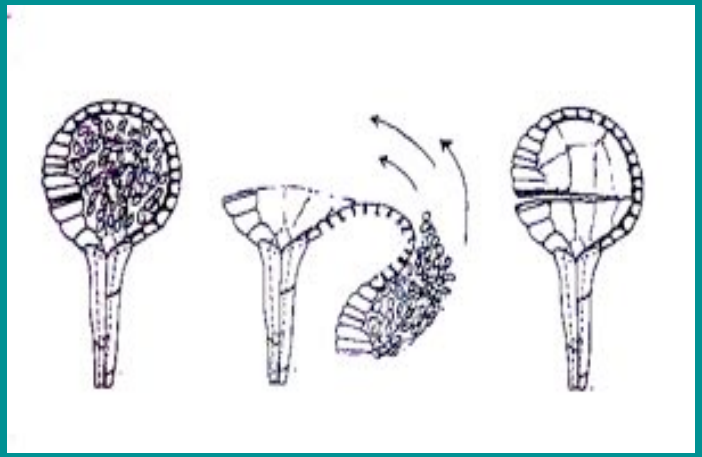
Spores are produced in spore cases called sporangia

- Shown is a mature spore case or sporangium (-a, pl.).
- The capsule holds the spores and is globular in shape.
- The incomplete ring of dark cells around the capsule, the annulus, acts as a spring that ejects the spores.
- The stalk supports the capsule.



Shedding of the spores

- The cells of the annulus have thin outer walls that dry readily.
- Drying puts tension on the capsule which breaks, snaps backwards and then recoils forward.
- As it recoils, the spores are thrown out of the capsule.
- The now broken capsule further dries, twists out of shape and eventually deteriorates.



Old sporangia

- This is an enlarged view of two old sporangia.
- A mature sporangium typically has 64 spores; here all but two spores have been shed in both sporangia.
- Note the capsule is broken and fragments of its transparent side wall are visible.
- The spores are bean-shaped in this species.

Spores

- Some spores find favorable places on which to grow, and in this way establish new plants.
- Each spore grows into a flattish bit of tissue called the gametophyte or prothallus. This stage produces the egg and sperm.
- Once the egg is fertilized it develops into the familiar fern plant (sporophyte) which eventually bears spores.
- In the next slide we see very young ferns in various stages, growing among moss in a very damp place.

Commercial use of spores

- Nurserymen grow large numbers of ferns from spores, mostly the ordinary species popular in the trade.
- Home gardeners may grow a variety of interesting ferns from spores they collect or obtain through friends or fern societies.
- Growing ferns from spores is covered in many fern books.

Will collecting spores injure the plant?

- Once ripe sporangia are found, only a small part of the leaflet needs to be removed for home gardening use.
- This will not injure a healthy plant.
- Spores, except green ones, are viable for months or more and are easily packaged and mailed.

Shed spores

- Here the shed spores are seen as a powder beneath the leaflets.
- Spores are far too small to be seen individually with the naked eye.
- Spores are easily scattered into the air by wind currents.

SPORE SEASONS

When are spores produced?

- In temperate areas most spores are formed from spring into late summer.
- Subtropical and tropical ferns produce spores in various seasons; some produce spores the year around.
- The best spores are found in the middle of the fern's spore production season.

When are fern spores produced?

- More spores are produced on ferns growing in sunnier locations than in denser shade.
- Some ferns produce large amounts of spores while other produce very little, but with spores a bit of powder produces a lot of plants.
- Very young ferns usually do not produce spores.
- A few ferns may be very irregular in their spore production time while others are very regular.

STERILE FERNS

- A few ferns are sterile and do not produce viable spores.
- These sterile plants are often hybrids or certain cultivated varieties.
- They may have empty sporangia or lack sporangia completely.
- If there are spores in the sporangia, they are often deformed and, in that case, not viable.

Examples of sterile ferns

- Among the sterile ferns are some species of Dryopteris, Boston ferns, Child's Pteris and others.
- Such ferns are reproduced by division or tissue culture.

***Pteris cretica* 'Childsii'**

FINDING FERTILE LEAVES

- The first step in collecting spores is to find a fertile leaf or frond.
- Leaves bearing spores are called fertile leaves.
- Sterile leaves do not bear fertile parts.

Asplenium oblongifolium, center leaf fertile as seen on back

Fertile and sterile leaves may appear the same

- Viewed from the upper surface, fertile and sterile leaves may look the same.
- Turn the leaves over and look for raised areas or patterns on the under surface.
- Look for clusters, mats, elongated shapes or ridges which occur in fairly regular patterns.

Pyrrosia hastata

Finding fertile leaves

- Differences in fertile and sterile leaves range from very slight to very great depending on the species.
- Note the slight difference between the fertile leaf (center) and sterile leaves on the sides.

Todea barbara

Finding fertile leaves

- In the leaflets shown here of the Climbing fern, the sterile leaflets on the right are just a bit wider and coarser than the fertile leaflets on the left.
- This is a noticeable difference, making it easy to find the fertile frond.

Lygodium japonicum

Finding fertile leaves

- Another difference is seen on the Parker's Brake fern.
- Here the fertile fronds are noticeably taller and their leaflets are much narrower than the sterile frond.

***Pteris cretica* 'Parkeri'**

Finding the fertile leaves

- Narrow or contracted fertile parts may involve the whole leaf or just parts of the leaf.
- In this Royal fern only the tips of the leaves are fertile.

Osmunda regalis

FINDING SPORANGIA

- Once a fertile leaf is found, the raised clumps, ridges or mats need to be examined for sporangia or sori.
- Sori or clusters of sporangia have distinct shapes and may or may not be covered.

***Pteris* with linear marginal sori, above;**

***Dryopteris erythrosora* with covered sori below.**

Variations in the fertile parts

- The clusters of sporangia form oval sori in this Chain fern.
- The clusters of sporangia form linear sori and are on both sides of the leaflet mid-rib in this Blechnum.

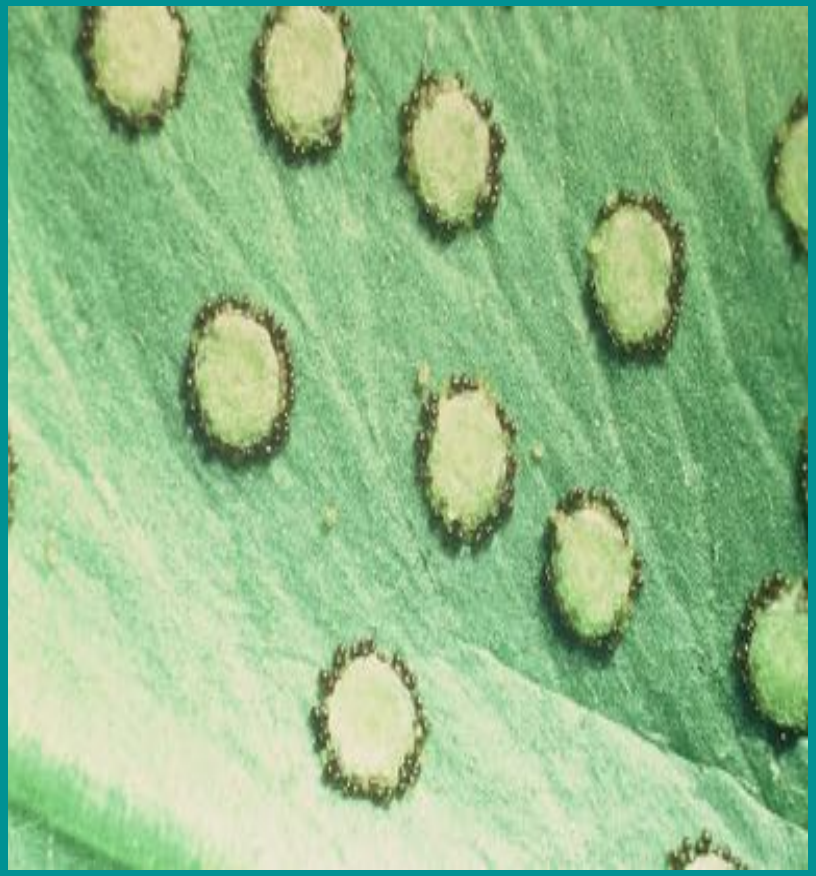
***Woodwardia* above; *Blechnum brasiliense* below**

Sori not covered

- In this Golden polypody, the sporangia are in round clusters or round sori and lack a covering.

Phlebodium pseudoaureum

Covered sori in Holly fern



- These sori are each covered with a flap of tissue known as the indusium (-a, pl.).
- Often times indusia are the first to be seen in searching for fertile material.

Cyrtomium falcatum

Sporangia in oblong sori and covered by indusia

- Each oblong sorus is covered with an indusium in this Chain fern.
- When the spores are ready to be shed from the sporangia the indusia will be pushed aside.

Woodwardia sp.

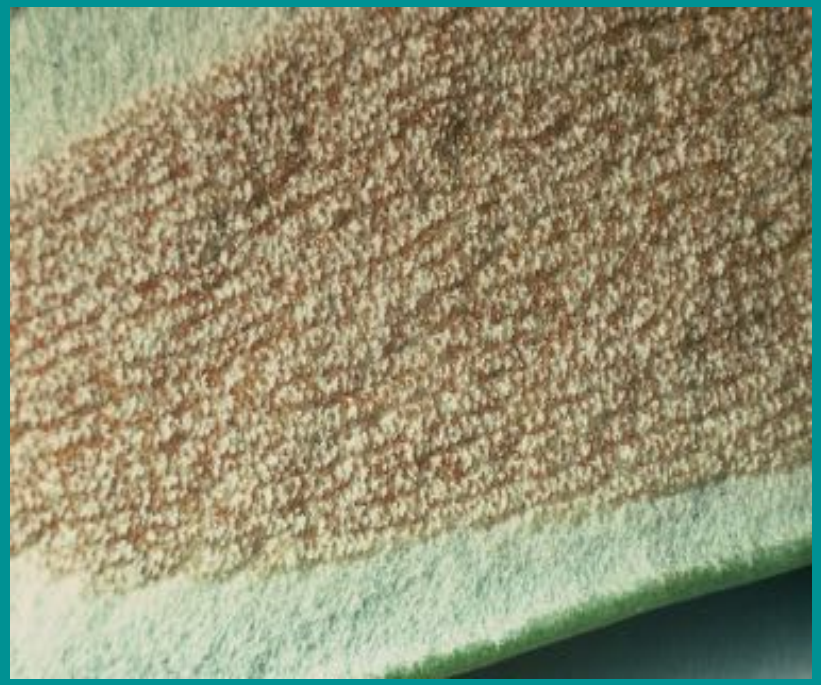
Finding the sporangia under the false indusium

- Sori and indusia may be at the very edge of the frond (as seen here from the underside) on this Maidenhair fern.
- The leaf margin is turned under to protect the sporangia.
- This type of indusium is called a false indusium.

Adiantum capillus-veneris

Sporangia under a mat of hairs

- A dense mat of hairs covers the underlying sporangia on Staghorn ferns.
- The sporangia are along the veins.



Platycerium bifurcatum

More variations in the clusters of sporangia or the sori

Pyrrosia, top left; ***Pellaea***, top right; ***Asplenium***, lower left; ***Thelypteris***, lower right.

Confusing insects with sori

Scale insects

Soft brown scale

- Sometimes amateurs confuse sori and indusia with scale insects.
- Scale insects will be irregularly scattered on the leaf surface.
- Scale insects often nestle next to the veins in no particular pattern.
- In contrast, sori and indusia are regularly arranged in a pattern on the underside of the frond.

Finding the sporangia: A review

- Sporangia are the spore cases containing the spores.
- Sporangia are typically on the under surface of leaves (fertile leaves).
- Sporangia may be variously hidden under hairs, scales, or flaps of tissue (indusia).
- Sporangia may be along leaf margins, along or at the ends of veins, or in mats.
- Sporangia in distinct clusters are called sori (sorus, singular).

FINDING RIPE SPORANGIA

- Sporangia collected too young will not release their spores; also immature spores will not germinate.
- Sporangia collected when too old will be mostly empty, having shed most of their spores.
- Sporangia that are ripe are mature and ready to shed spores which will be viable.

A handy tool

- Spores are too small to be easily seen.
- Ripeness is determined by looking at the sporangia, sori, and indusia.
- Identifying ripe spores is more accurate if a hand lens or jeweler's loupe is used.

A variety of hand lenses

Using the hand lens

- Hand lenses that magnify up to 10 x are best.
- Ordinary hand lenses magnify about 2x. Though not ideal, they are certainly better than the naked eye.
- It is possible to determine ripeness without using a lens, but there is less accuracy.
- Hold the leaflet with the sori in the brightest light possible. Be sure that your head does not shade the sori.
- Place the lens close to the sori and gradually bring the lens back towards your eye until the sori come into focus.
- If you prefer to place your eye close to the lens and move the sori towards your lens, be sure to keep the sori in bright light.

Sporangia: Too Young

- Very young sori appear green, small and compact.
- As they become older, the sporangia start to expand, rise, become more plump and tend to spread apart.
- Here sporangia are discernable as tiny bumps on the rounded immature sori.
- The young sori often take on a slightly glistening appearance due to their smoother, firmer texture.

Sphaeropteris cooperi

Ripe sporangia

- When the sori turn dark (usually brown, dark brown or black) and still appear plump, they are usually mature or nearly so.
- Spores are ripe and ready to be collected when the first few sporangia start shedding.
- This will make it more certain that the remaining sporangia will have ripe spores.

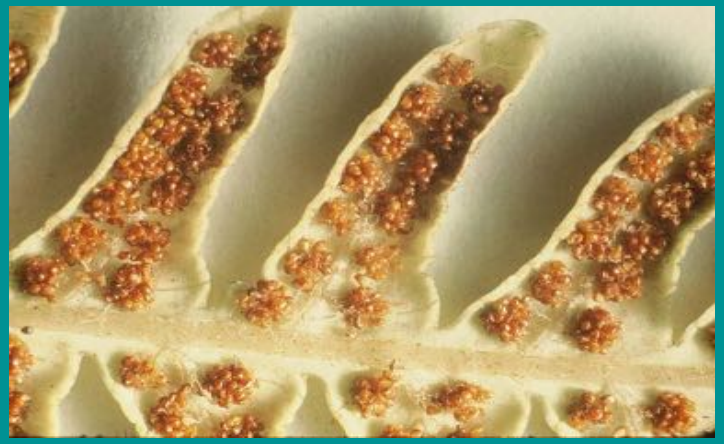
Sphaeropteris cooperi

Old Sporangia

Sphaeropteris cooperi

- Old sori appear loose and frayed. Their sporangia have opened and shed most of their spores.
- Some ferns have dark spores and when the sporangia are emptied, they often turn a lighter color.
- The darker cells of the annulus may twist and stick out, giving an untidy look to the sorus.

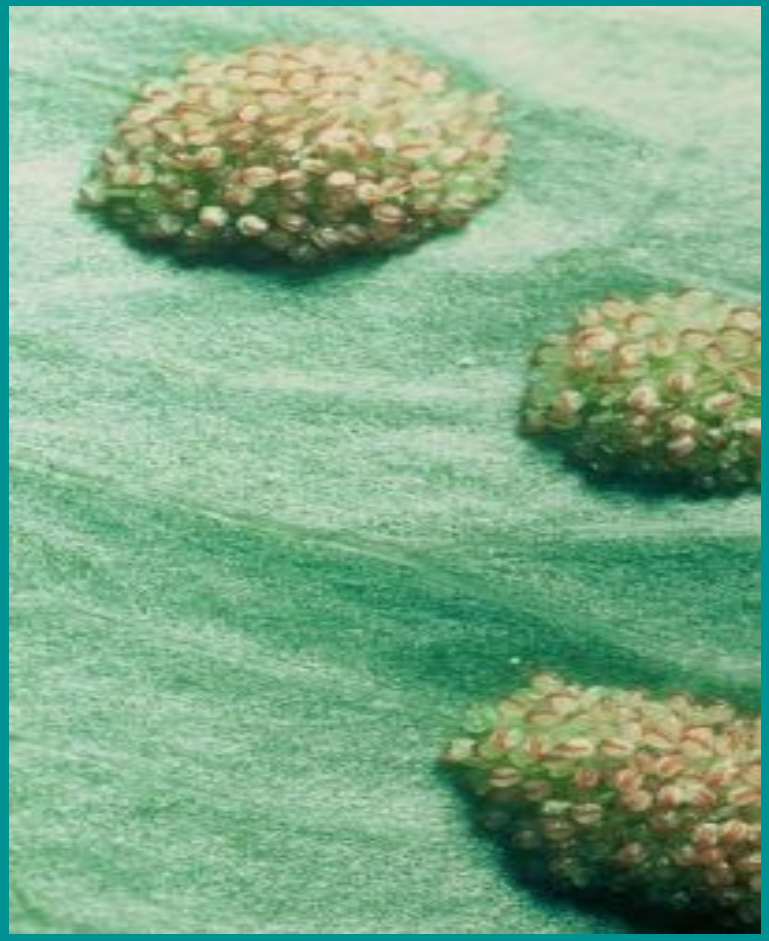
A Comparison: too young, too old, ripe



Sphaeropteris cooperi

A closer look at the young, developing sporangia

- The capsules of the older sporangia are on the outer surfaces of the sori. The shorter, younger, greener sporangia are barely visible beneath and between them.
- As the sporangia mature they go from pale green to tannish-green and then darker.



Phlebodium pseudoaureum

Still too young

- If indusia are present they will usually appear as light green to light tan.
- They are tightly and neatly molded over the sori as shown here.

Dicksonia antarctica

Still too young

- Here the indusia are slightly looser than in the preceding picture.
- But the shape and pale green color still indicate immaturity.

Thelypteris puberula

Ideal stage of ripeness in Maiden fern

Thelypteris puberula

A few oldies among the ripe ones

- Note the lighter colored sporangia in the upper left sori.
- These sporangia have just shed their dark spore, hence they appear lighter in color.
- Though these light colored capsules might look intact they are torn and empty.
- Sharp changes of color among many ripe sporangia indicate old or empty sporangia.

Thelypteris puberula

Too young, some ripe and others too old

- On the left most of the sori are still developing and have not emerged from under the indusia.
- But in the lower part, a few are ripe and pushing the indusia aside.
- The right leaflet shows the sori very loose and frayed; they have shed their spores and are too old.
- Also note the indusia are pushed well aside.

Asplenium oblongifolium

The indusia in old sporangia

- In old sori with indusia, the indusia will dry, shrivel and lift away from the sori.
- The indusia may stay in place or drop off.
- The sori look very frayed and untidy.

Dryopteris sp.

Enlarged view of very old sporangia

- Very old sporangia are bent and twisted
- The spores have long since been shed.
- The cells of the sporangia have dried and are disintegrating.

A PICTORIAL
COMPARISONS OF YOUNG, RIPE, AND OLD SPORANGIA

- The following series of pictures are ferns showing the sori or sporangia in young, ripe and old stages.

- Some pictures may be between two stages.

Holly fern
too young

Cyrtomium falcatum

Holly fern

- The black sporangia next to the indusia are ripe.
- The lighter sporangia have shed their spores.

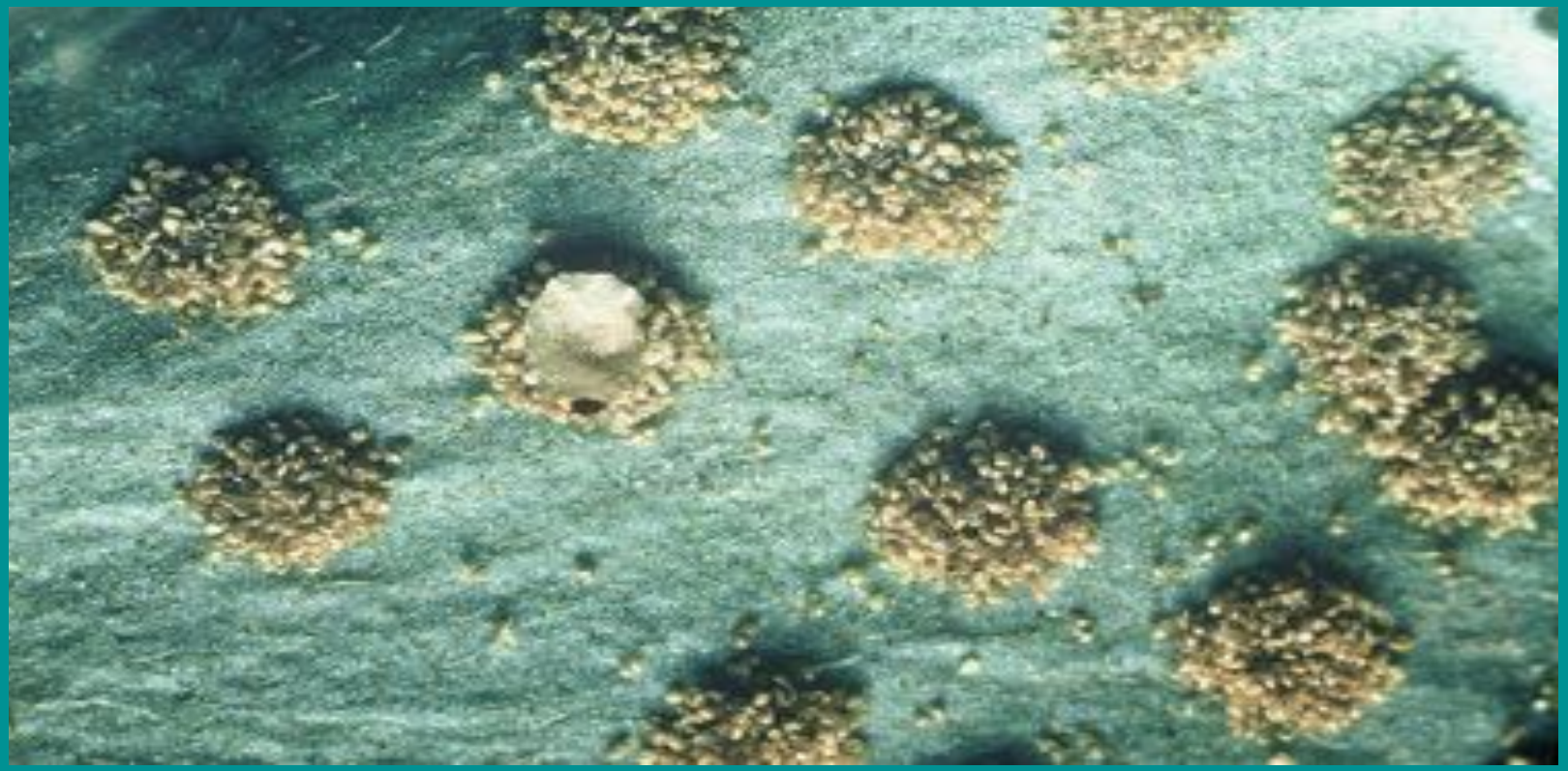
Cyrtomium falcatum

Holly fern
past prime and too old

- Sori on the left may still have some spores but most are gone as evident by the loose mildly frayed sporangia and loose tan indusia.
- Sori on the right have lost most of their spores and are too old as evident by the very loose frayed sporangia and detached indusia.

Cyrtomium falcatum

Holly fern
too old



Cyrtomium falcatum

Holly fern
too young, too old, just ripe

Cyrtomium falcatum

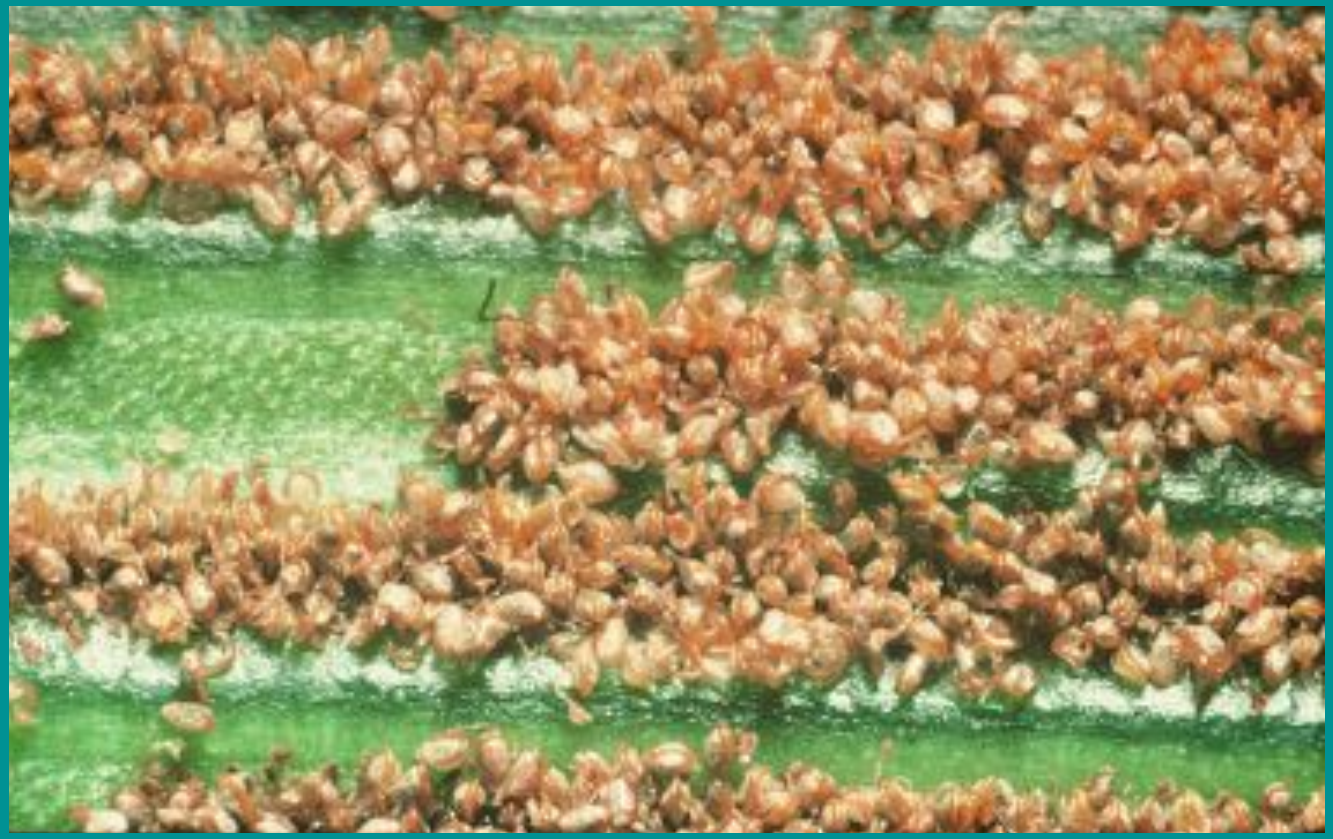
Bird’s nest fern
too young

Asplenium australasicum

Bird’s nest fern
ripe

Asplenium antiquum

Bird’s nest fern
too old

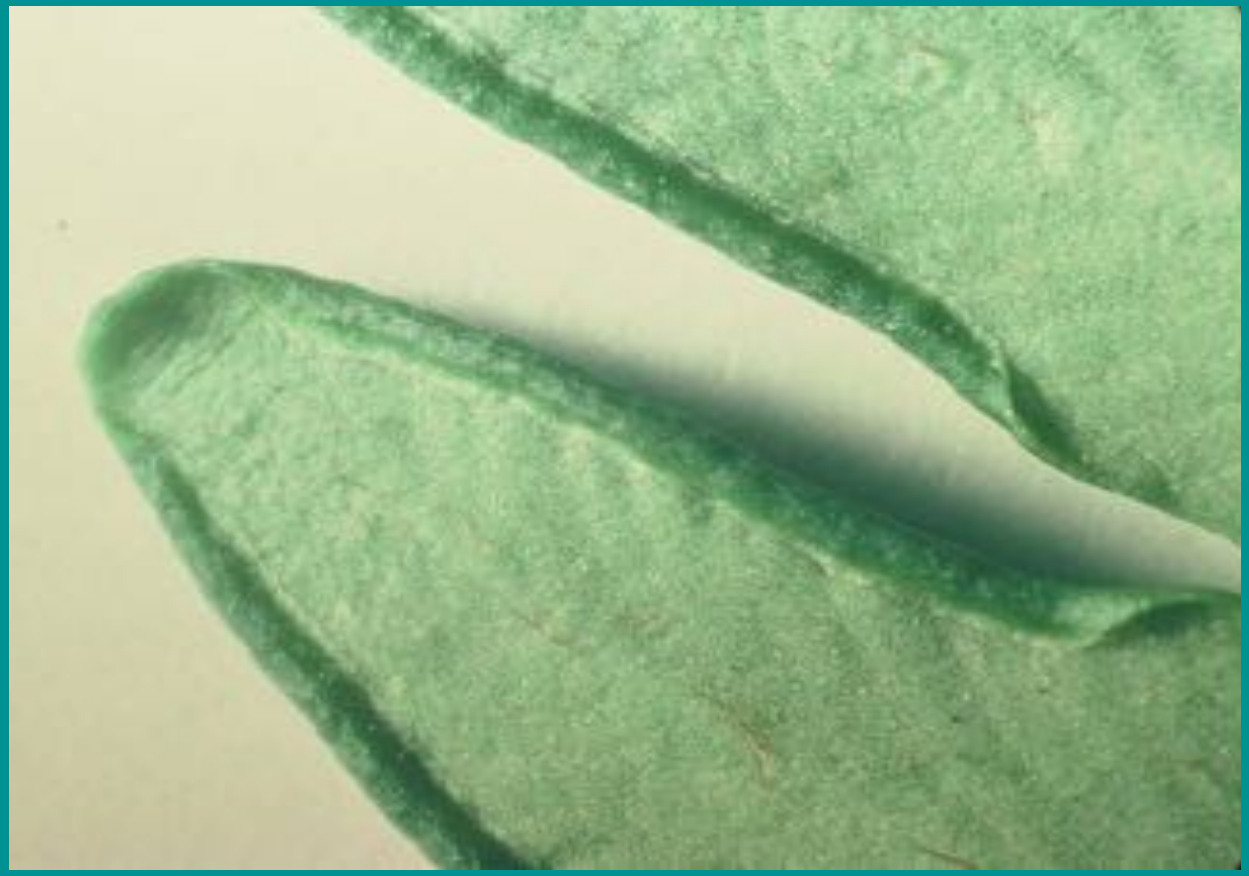


Asplenium antiquum

Bird’s nest fern
too young, too old, ripe

Asplenium antiquum

Australian cliff brake
too young



Pellaea falcata

Australian cliff brake
just right

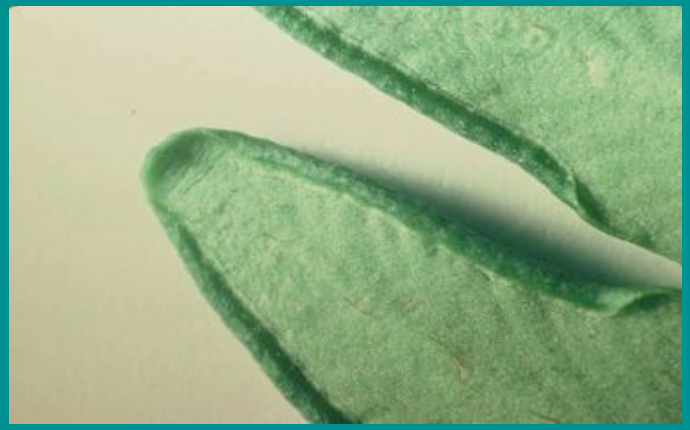
Pellaea falcata

Australian cliff brake
too old

Pellaea falcata

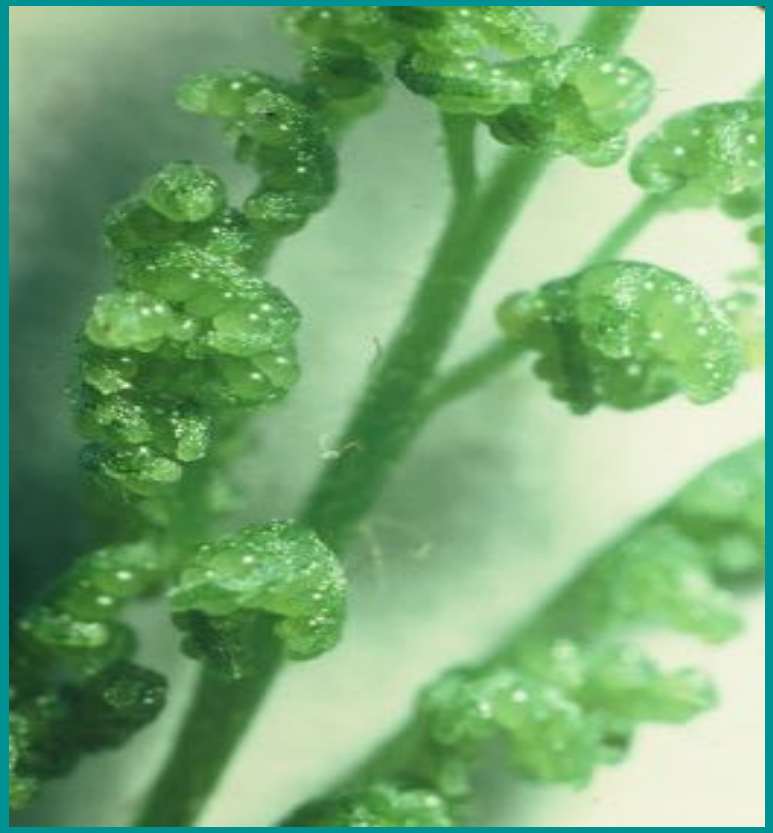
Australian cliff brake

Too young -- too old -- just right



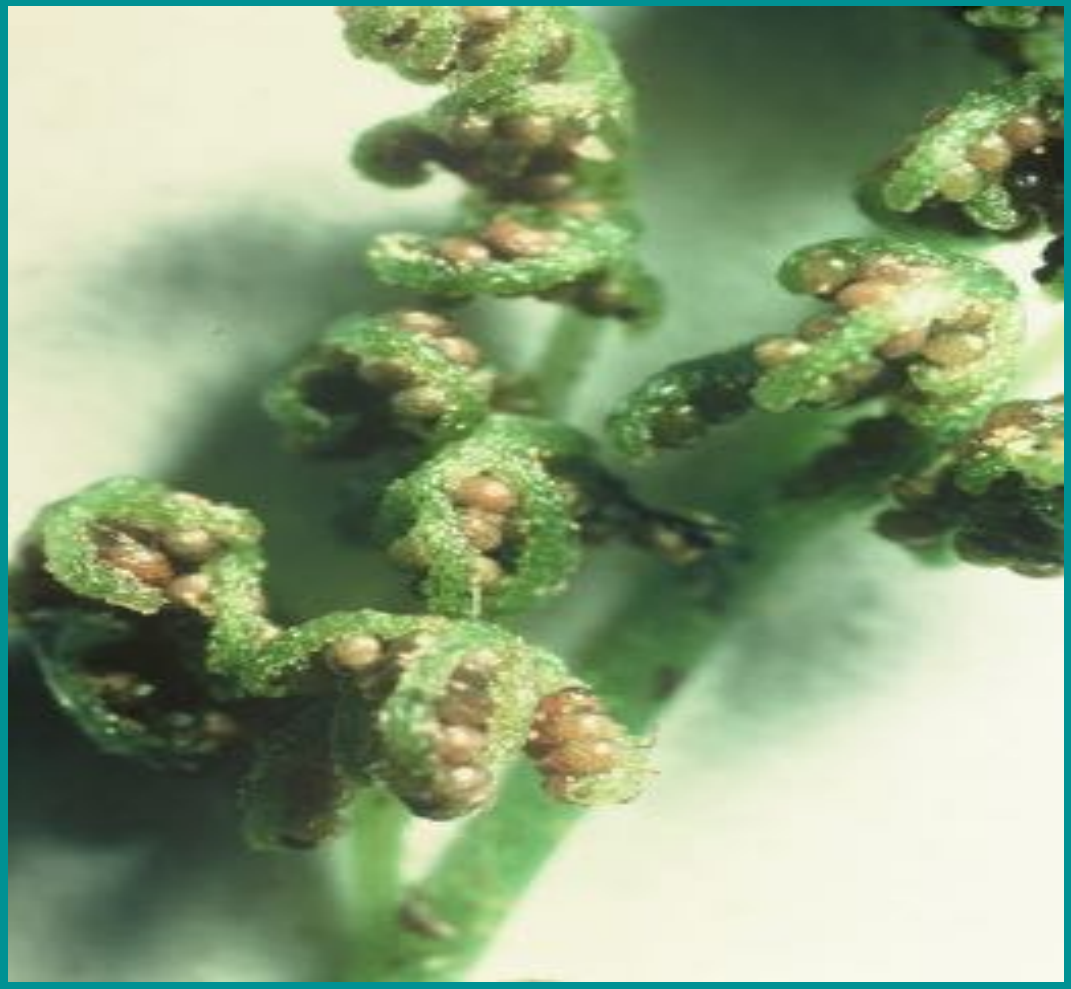
Pellaea falcata

Anemia fern
too young



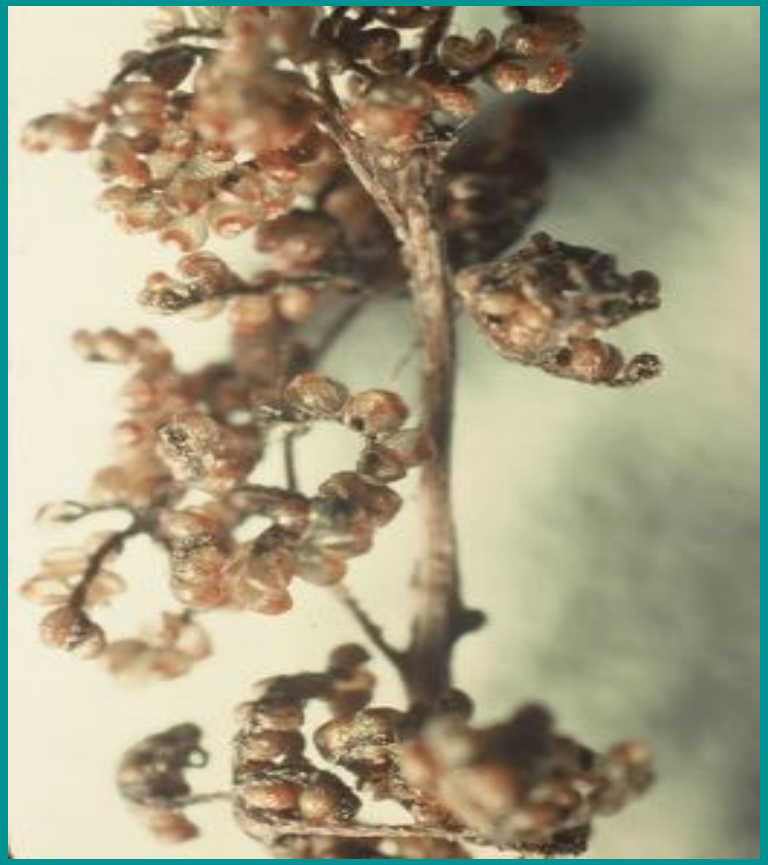
Anemia phyllitidis

Anemia fern
A mixture, black ones ripe



Anemia phyllitidis

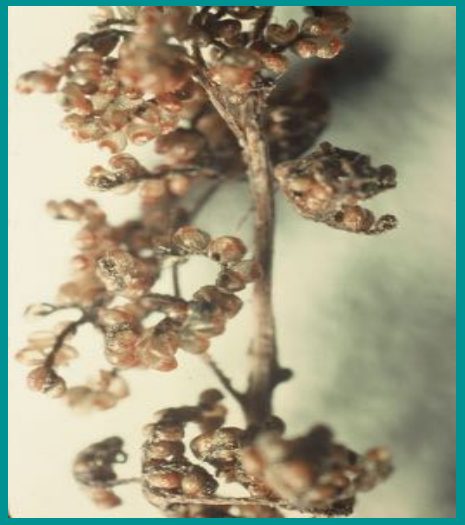
Anemia fern
too old



Anemia phyllitidis

Anemia fern

too young -- too old -- black ones ripe



Anemia phylltidis

Squirrel’s foot fern
too young

Davallia mariesii* var.*stenolepis

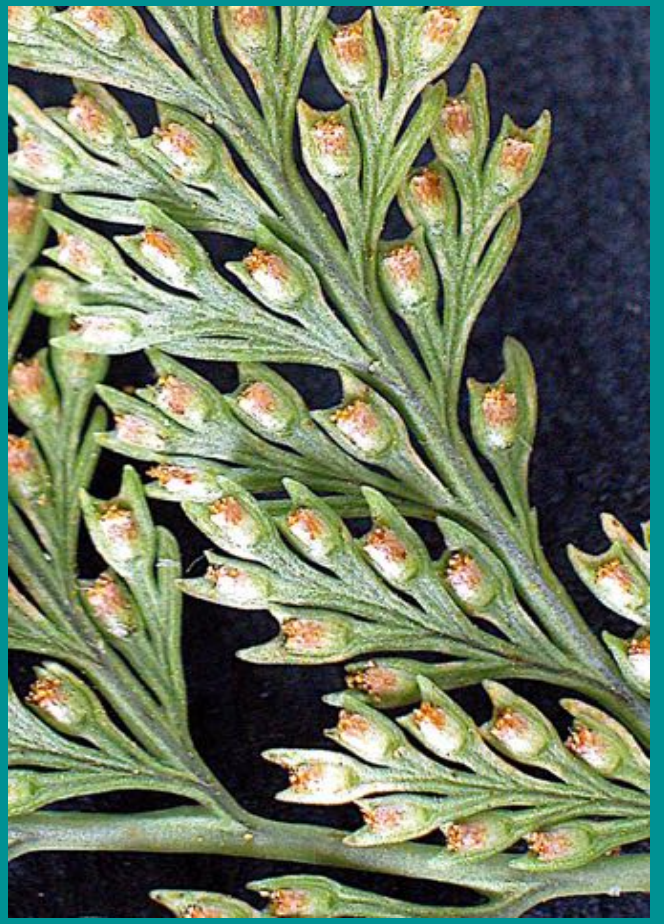
Squirrel's foot fern
ripe

Davallia mariesii* var. *stenolepis

Squirrel’s foot fern
too old

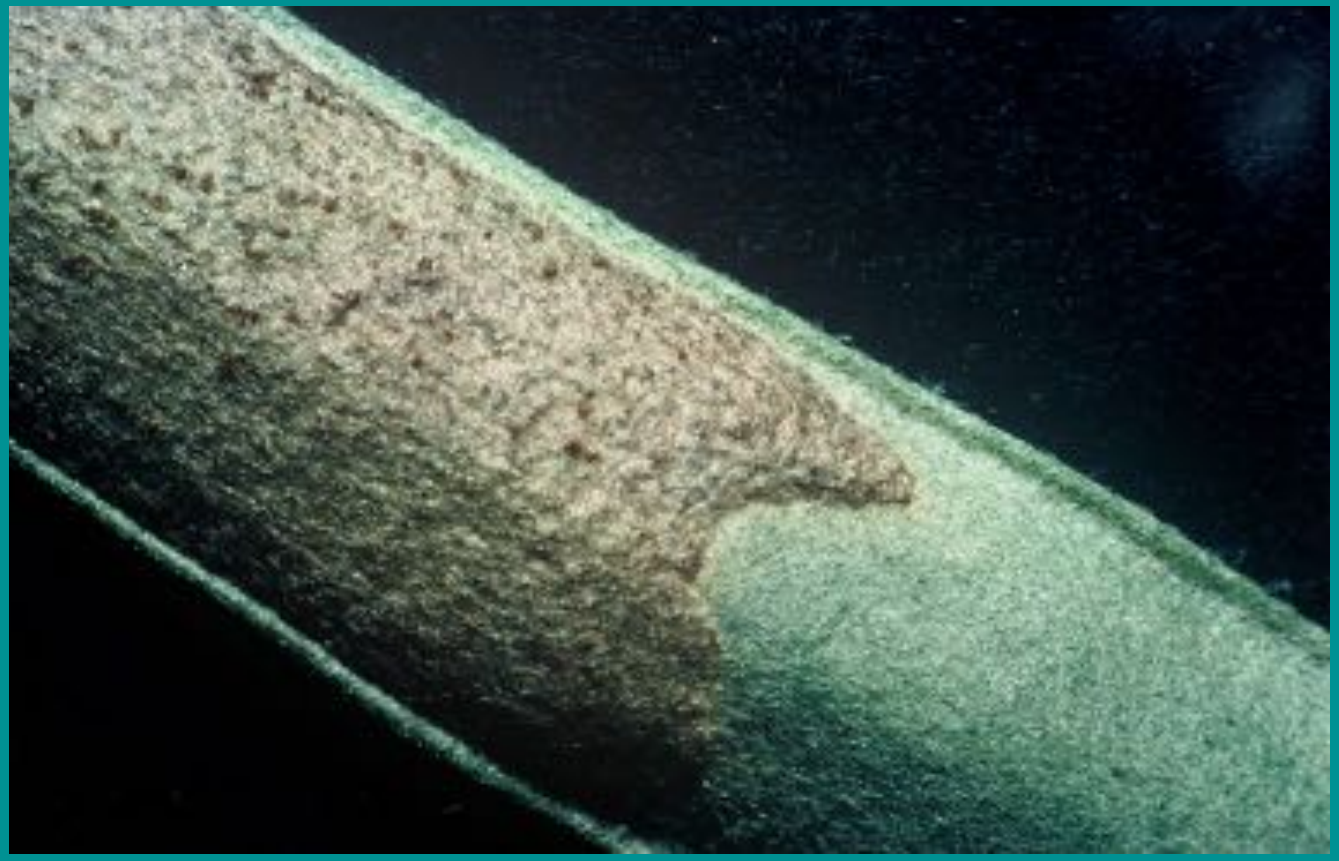
Davallia mariesii* var.*stenolepis

Squirrel's foot fern
too young--too old--ripe



Davallia mariesii* var.*stenolepis

Staghorn fern
too young

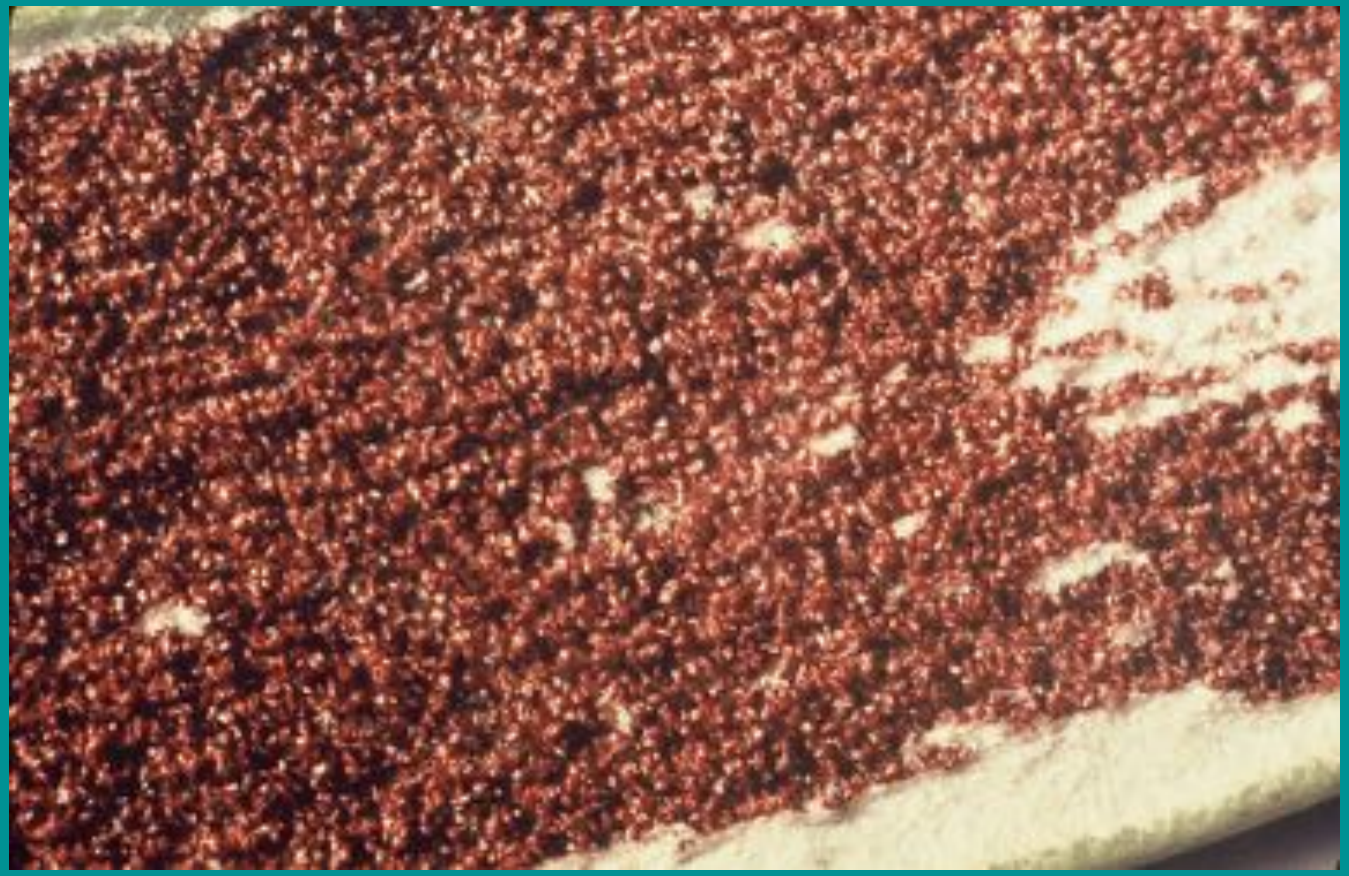


Platycerium bifurcatum

Staghorn fern
ripe

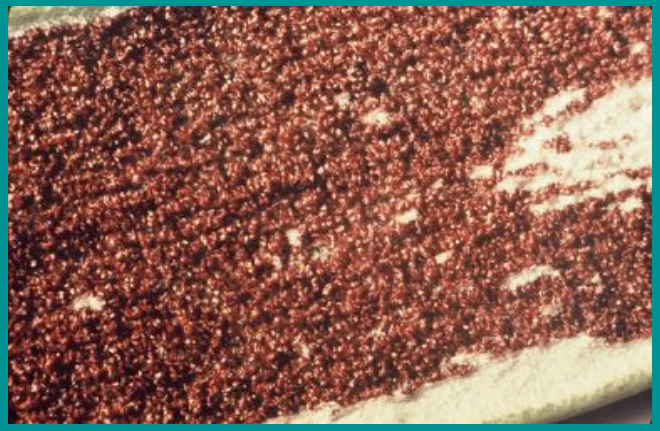
Platycerium bifurcatum

Staghorn fern
too old



Platycerium bifurcatum

Staghorn fern
too young -- too old -- ripe



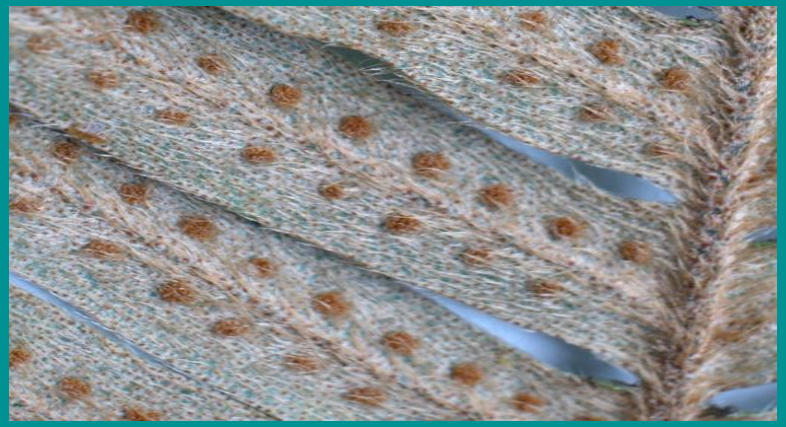
Platycerium bifurcatum

UNUSUAL PROBLEMS

- HAIRS OR SCALES HIDING SPORANGIA OR SORI.
- TROUBLE LOCATING RIPE SPORANGIA ?
- NO SORI OR SPORANGIA FOUND.
- SORI OR SPORANGIA THAT ARE RIPE WHEN GREEN.
- SORI OF MIXED AGES ADJACENT TO EACH OTHER.
- SHORT ON SPORES?

Covered Sporangia
Determining their ripeness

- If the sporangia are covered with hairs or scales and their ripeness cannot be determined, gently brush the covering aside to examine the sporangia for ripeness.



Polypodium sanctae-rosae, Platycerium bifurcatum

Troubles locating ripe sporangia?

- If the first sori examined on a frond are a bit too young, look down the frond or on the next older frond.
- If the first sori examined are too old, look up the frond or on the next younger frond.
- The sori are oldest at the base of the frond and become progressively younger towards the tip of the frond.
- The oldest fronds (and sori) are farthest away from the growing point (where new fronds emerge) and the youngest fronds are closest to the growing point of the plant.

No Sori or Sporangia Found

- If ripe sporangia are not found, check ferns earlier or later in the season or check older ferns.
- Most young plants do not produce sporangia.
- Or the fern may produce its sporangia only at certain seasons.
- Some ferns may need special cultural conditions to produce spore.
- An uncommon situation, the fern may be sterile.

Sori or Sporangia that are ripe when green

- Some ferns have sporangia that shed their spores when green.
- Most of these ferns have fairly large sporangia and green spores.
- They include species as Todea, Royal ferns, Ostrich ferns, Sensitive ferns, Grape ferns, Horsetails and others.
- The green spores of these ferns have a short viability period and should be sown in a few days.

***Todea barbara*, upper; *Osmunda regalis*, lower**

Collecting spores from green sporangia

- To locate green sporangia with ripe spores, pick leaflets that have both green and tan sporangia.
- The tan sporangia have shed their spores and the adjacent green ones will be the next ripest sporangia.

Todea barbara

Sori of mixed ages adjacent to each other

- Rarely some ferns produce different aged sori next to each other.
- For purposes of collecting spores, select the leaflet bearing the most ripe sori.

Short on spores?

Come back a few days later

- In the true tree ferns species, such as Cyathea, the sporangia in a sorus all ripen at about the same time.
- In most other fern species, the sporangia ripen in sequence.
- A few ferns have a mixture of both conditions.
- If ample ripe sporangia are available this information is not important.
- However when there is a shortage of ripe sporangia, waiting a few days before picking more fronds or leaflets may yield more ripe spore.

COLLECTING SPORES

- Once you have located a frond or leaflet with ripe sporangia, cut that part off the fern.
- This is best done on a cool day to reduce the contamination from other fern spores.
- And this also prevents the desired spores from being scattering during the collecting process.
- Warm very dry weather causes the spores to be shed more quickly.

Collecting the spores

- Gently brush or wash off any soil or dust on the surfaces of the leaf or leaflet bearing ripe sporangia.
- Place the leaf or leaflet with the sporangia side down in a clean leak proof envelope or in a paper packet made of smooth thin paper.
- A closable paper bag or a shoe box with a lid will also do.
- Lining the bottom of the shoe box with a smooth piece of paper facilitates the packaging process.

Containers to use

- Spores are best collected in or on smooth, thin paper sheets, envelopes, or packets.
- Thin paper easily folds flat and this leaks less.
- Spores will not stick to very smooth paper.
- DO NOT USE PLASTIC BAGS OR WRAPS as spores will stick to the surface and be difficult to remove.

Protect from air movement

If the leaf or leaflets are placed over smooth paper to catch the shed spores, keep the paper and frond covered or in a covered box to prevent breezes from blowing the spore away.

How to Collect Spores

- Remember, do not use cellophane or plastic bags or plastic wrap to collect spores as the spores will stick to their surfaces and be difficult to remove.

- Smooth white paper sheets, envelopes or paper bags have suitable non stick surfaces.

Shedding of the spore

- When there is no further increase in the amount of spore powder shed, remove the leaf or leaflets and discard them.

- Some fern species produce few spores per frond while others produce copious amounts.

Shedding of the spores

- Some ferns shed nearly pure spores; other species shed both spores and sporangia cases and other debris.
- Pure spores will appear as a fine, uniform textured powder.
- If the shed powder seems to be a mixture of debris and spores, try separating spores from the debris by the following steps:

Do you have spores?

- Place a heap of the the shed powder on a sheet of smooth white paper.
- Tilt the paper slightly and gently tap the paper beneath the powder.
- If the powder separates, the rear part is denser, finer and more uniform in texture. This is the spore.

Do you have debris?

- The forward section should be lighter, fluffier, more irregular or coarser in texture. This is the debris.
- This debris may be brushed away and discarded.
- If there is no separation see frame 99, *The powder does not separate.*

Texture comparisons of spore and debris

- The scattering of fine textured smudges and spots in the upper part of the frame are pure spores (black for this species).
- The coarser textured powder below are the empty sporangia cases (reddish brown for this species) and irregularly shaped debris.

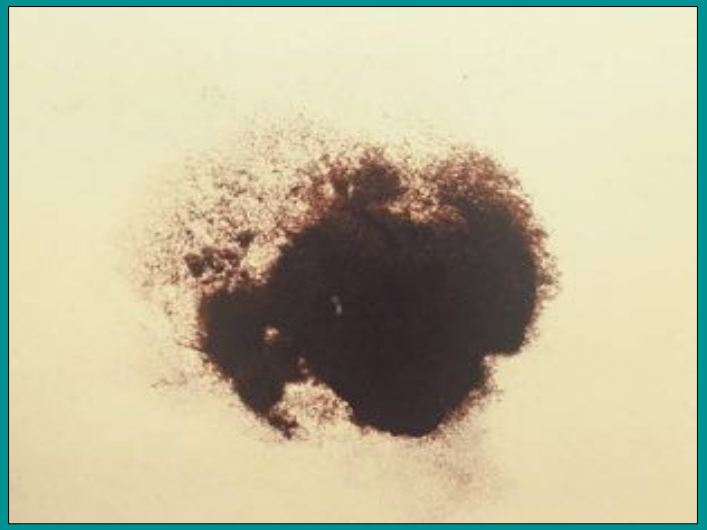
Enlargements of spore and debris

- To the right, the pure spores form a uniform fine textured powder.

- To the right, the empty sporangia cases are seen as discrete roundish units.
- Other debris particles are irregular in shape.

Mostly pure spores

- Without the hand lens the spores will look like this picture.
- The color may be shades of brown, yellow, black, or green.



Empty sporangia and debris

- Sporangia and other debris will be relatively coarse, fluffy, and not uniform in texture or color.
- This is the way it will appear under the hand lens in Staghorn ferns , Their sori are covered with hairs.
- The debris will be mostly in shades of brown and usually of different shapes.
- This material is usually whisked away and discarded.

The powder does not separate

- The powder may be pure spores as in frame 96, *Enlargements* and frame 97, *Mostly Pure Spores*. If spore is not seen, the following conditions may exist:

- The spores were overlooked; some spores are very small or almost translucent (probably immature) or the spores do not separate easily from the debris. Confirmation must be made through a microscope with 50x or more power.

- Some ferns readily shed intact sporangia once the fronds have been picked. The shed powder is coarser than pure spore, but fairly uniform in appearance. The intact sporangia may be identified with a hand lens. By giving the sporangia more time to dry they may shed their spores. However the spores may be immature and not viable. On these ferns, pick the leaflets when some sporangia are seen to be shedding.

- The powder is mostly empty sporangia and debris. The sporangia were too old. The collecting process will need to be repeated.

You have spores; now what's next?

- If the spore are relatively free of non-spore material, they may be packaged for use. See frame 106, ***Storing spores***.
- If you desire to further clean the spores of non- spore material see frame 102, ***Cleaning spores***.

Alternative ways to collect spores

- Where large envelopes or boxes to hold fronds are too cumbersome to use or there is no time to wait for the spores to be shed, the collector may scrape ripe sporangia off the frond with a small knife.
- The scrapings are collected in a small leak-proof envelope and carefully sealed.
- The scrapings may also be collected on thin smooth paper and the paper folded into a leak-proof packet.
- Keep in a dry cool place.
- Though non-spore material will be mixed with the spores, this debris may be separated later.

CLEANING SPORES

- Is it necessary to clean the collected spores of non-spore material? No, but the cleaner the spores, the less trouble there will be with molds, algae, and weedy ferns in the plantings.

- How pure do the spores have to be? If the spore material is only a small part of the total powder volume, some attempt should be made to reduce the non-spore material.

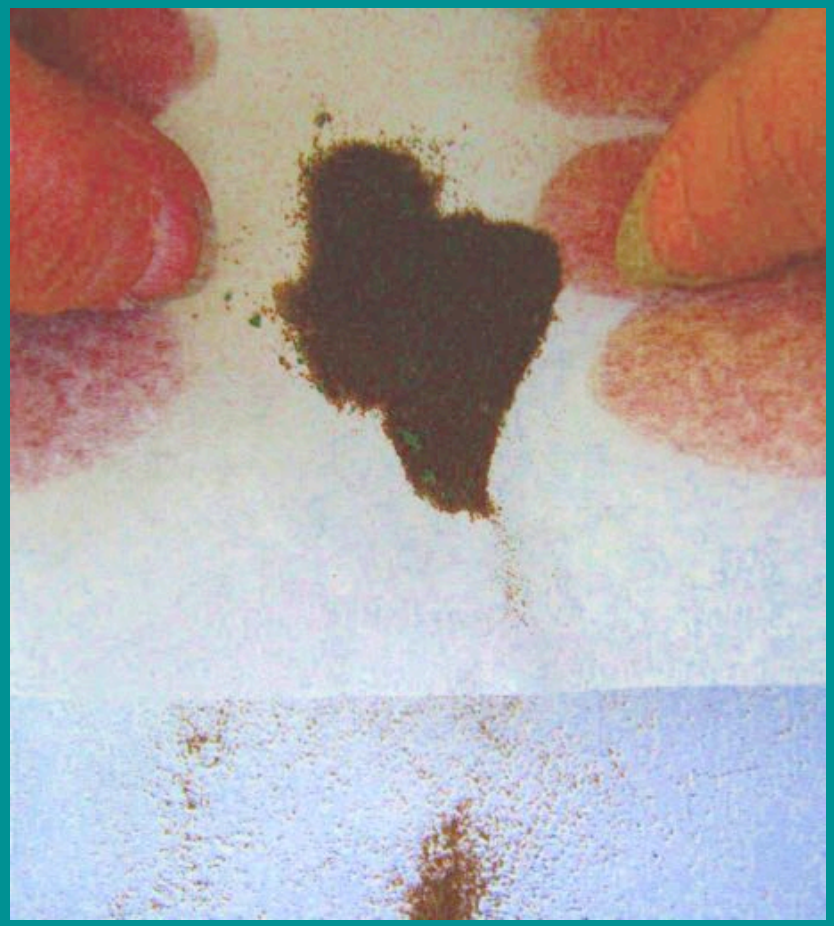
- If you decide to clean the spores further, work in an area with little air movement to prevent loss and contamination of spores.

A simple way to clean spores

- As mentioned earlier, work in a place with little air movement.
- Place the powder collected from the fern on a clean sheet of paper. Tilt the paper slightly and gently tap the paper beneath the powder.
- The empty sporangia and other debris will bounce forward and separate from the denser more uniformed textured fern spores.
- Whisk the empty sporangia and debris away and discard. Brush the spore into a leak proof packet or envelope.
- The level of purity obtained by this method is suitable for most fern growing needs.

Other methods of cleaning spores

- Sifting the powder through lens paper (see to right) , a very fine wire screen, or layers of women's sheer stockings separates the spores from the debris.
- Do not expect perfect spore separation; some debris may slip through.
- Lens cleaning paper is made of loose fibers with spaces large enough to let the spore through.



Sifting through lens paper: spores and debris above, clean spores below

How pure do spores have to be?

- Do not be concerned with a small amount of non-spore material that may slip through the lens paper or screen along with the fern spores.
- Only specialized growers need absolutely clean spores. Also they usually disinfect the spores before sowing.

STORING SPORES

- Spores may be stored in leak-proof paper packets or envelopes. Products made of thin smooth paper are best.
- Check to see that spores are not leaking out of their containers. Envelope flaps and corners often leak; fold them over to stop leaks. Tape the fold down if necessary.
- ***Do not use plastic bags, plastic wraps or any such material to hold spores. The spores will stick to their surfaces!***

Label the packets of spores

- Label each collection with the
  - Name of the fern
  - Date of Collection
- Additional desirable information
  - Place of collection
  - Name of collector
- Store the spores in a cool, dry place.
- Spores stored in a refrigerator last longer.

How long are spores viable?

- Spores, except green ones, may last months to years, particularly if stored in a cool dry place, as a refrigerator.

- However, germination is best with fresh spore.

Viability of green spores

- Green spores should be sown immediately or within days after being collected.
- They may be viable a bit longer if kept in the refrigerator.
- Commonly grown ferns that have green spores include *Osmunda*, *Onoclea*, and *Todea*.

Todea barbara

REVIEW
How to Collect Fern Spores

- Locate a fertile frond.
- When fertile and sterile fronds look the same from the top, search on the underside for sori.
- Some ferns have different appearing sterile and fertile fronds, making it easy to spot fertile fronds.

Dryopteris erythrosora

Look for the fertile parts

- Fertile parts are typically on the underside of a frond and have a distinctive shape.
- They are raised structures that may be round, elongate, linear, lining the leaf margins, in mats, or borne on contracted leaf parts.
- They may be uncovered or have a covering of hairs, scales, or more often a flap of tissue, the indusium.

Polypodium

Review

Examples of fertile parts

***Pyrrosia*, above left, no indusia; *Pellaea*, above right; elongate marginal indusia; *Asplenium*, lower left, a linear indusia; *Thelypteris*, lower right, kidney-shaped indusia.**

Review

The fertile parts are the sporangia and sori

- A hand lens will show the fertile parts to be tiny bead-like structures or sporangia.
- Sporangia contain the spores.
- A cluster of sporangia is called a sorus (-i, pl.).
- The age of the sporangia (or sori) is critical in collecting viable spores.

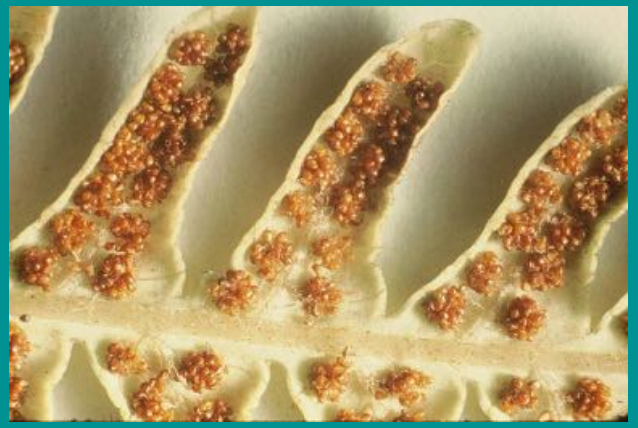
Pellaea ovata

Importance of sporangia age

- Sporangia contain the spores and must be ripe or mature to provide viable spores.

- Young sporangia once removed from the fern will not ripen.

- Old sporangia will have shed their spore and be mostly empty.



Sphaeropteris cooperi

Finding the ripe sporangia

- This leaflet contains mostly ripe sporangia. The ripe sporangia have not shed their dark spores, but are ready to do so. This is in contrast to the few lighter sporangia which have shed their dark spores.
- The ripe sporangia capsules also appear plump and intact.
- The sori are still fairly compact, not loosely spreading and frayed.
- The indusium has just started to lift from the sori.

Thelypteris puberula

Collecting spores

- Pick the frond or leaflet with the ripe sporangia or sori.
- Remove surface dust and debris.
- Put frond or leaflet in a leak proof envelope or folded paper packet or coverable boxes lined with smooth paper.
- Place in a dry place, protect from drafts or breezes.

Shedding of the spores

- Let the fronds dry for a few days or until the powder beneath the frond ceases to increase.
- This powder is the fern spores but may be mixed with other debris.
- To clean the powder of most non-spore material (empty sporangia cases and debris), carefully collect the powder on a sheet of paper.

Separating the spores from the non-spore debris

- Tilt the paper slightly and tap it gently under the heap of powder to separate non-spore material from the spore.
- The lighter, fluffier non-spore material bounces forward first, and may be discarded by brushing it away.
- The spores are the last to separate (yellow in this species) and have a denser, finer, more uniform texture.

Dicksonia antarctica

Packaging the spores

- Package the spores in leak-proof paper packets or envelopes. Glassine envelopes are very suitable.
- Do not store in plastic bags or plastic wrap or anything to which spores will stick.
- Check to be sure there are no leaks in the packet or envelope.

Labeling the collection

- Label the packet or envelope with:
  -Name of the fern
  -Date of Collection
  -Place of Collection
  -Name of Collector
- Fern spores destined for scientific work require full labeling and sometimes additional information.
- Store the packaged spores in a cool, dry place or refrigerator.

Spore viability

- Most spores will remain viable for months or more.
- The exception occurs with green-colored spores which should be sown within days of collection.
- Generally, the fresher the spores the better the germination.
- Refrigeration prolongs the viability of spores.

Thanks for your participation!

- This tutorial has presented some basic information on *How To Collect Fern Spores*. There are, however, many other variations and methods not mentioned here that are equally suitable in achieving spore collection.
- For those not familiar with the process, this tutorial can be a start in a new activity, and in gaining new ‘hands-on’ information about ferns.
- For those who are familiar with the process, it is our hope that you are inspired to continue your interest and provide new sources of ferns for fern gardeners, fern societies, and botanical studies.

Packets may be sent to various fern societies for distribution to members.

For addresses see the

AFS homepage: www.amerfernsoc.org

Fern spores may also be sent to the American Fern Society as follows:

The AFS Spore Exchange

c/o Brian Aikins

3523 Federal Ave.

Everett, WA 98201-4647

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