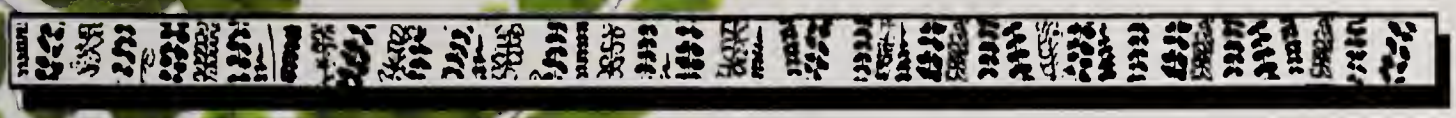
Hardy Fern Foundation Quarterly



Summer 2008

THE HARDY FERN FOUNDATION

P.O. Box 3797

Federal Way, WA 98063-3797

Web site: www.hardyferns.org

The Hardy Fern Foundation was founded in 1989 to establish a comprehensive collection of the world's hardy ferns for display, testing, evaluation, public education and introduction to the gardening and horticultural community. Many rare and unusual species, hybrids and varieties are being propagated from spores and tested in selected environments for their different degrees of hardiness and ornamental garden value.

The primary fern display and test garden is located at, and in conjunction with, The Rhododendron Species Botanical Garden at the Weyerhaeuser Corporate Headquarters, in Federal Way, Washington.

Satellite fern gardens are at the Birmingham Botanical Gardens, Birmingham, Alabama, California State University at Sacramento, Sacramento, California, Coastal Maine Botanical Garden, Boothbay, Maine, Dallas Arboretum, Dallas, Texas, Denver Botanic Gardens. Denver, Colorado, Georgeson Botanical Garden, University of Alaska, Fairbanks, Alaska, Harry P. Leu Garden, Orlando, Florida, Inniswood Metro Gardens, Columbus, Ohio, New York Botanical Garden, Bronx, New York, and Strybing Arboretum, San Francisco, California.

The fern display gardens are at Bainbridge Island Library, Bainbridge Island, WA, Bellevue Botanical Garden, Bellevue, WA, Lakewold, Tacoma, Washington, Les Jardins de Metis, Quebec, Canada, Rotary Gardens, Janesville, WI, University of Northern Colorado, Greeley, Colorado, and Whitehall Historic Home and Garden, Louisville, KY.

Hardy Fern Foundation members participate in a spore exchange, receive a quarterly newsletter and have first access to ferns as they are ready for distribution.

Cover Design by Willanna Bradner

HARDY FERN FOUNDATION QUARTERLY

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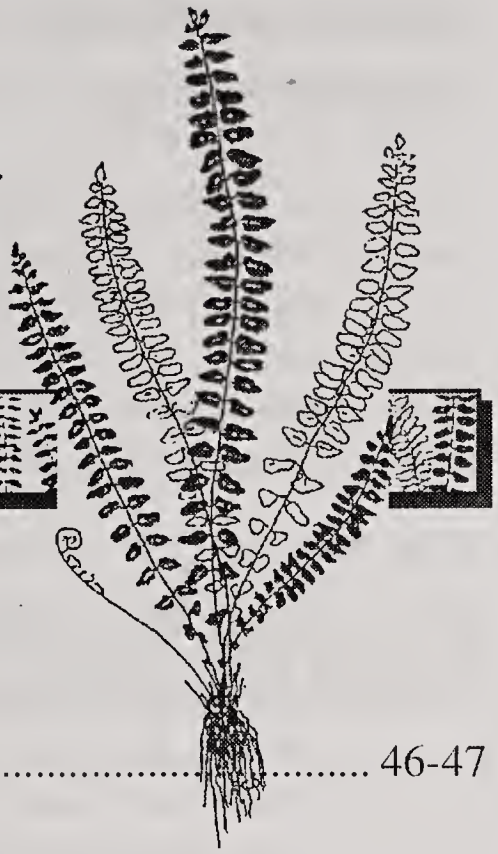


The Spore Exchange Needs You!

Please send your spores to our Spore Exchange Director:

Katie Burki
501 S. 54th St.
Tacoma, WA 98408

Fern Quarterly – Summer 2008

President's Message

The Pacific Northwest recorded extraordinarily cool and cloudy weather earlier this year. Yet this same weather marked one of the most beautiful springs I have ever witnessed. With very little sunshine flowers faded slowly and the colors remained vibrant. On the downside, everything is late and there is little chance of properly ripening more than a couple of tomatoes before autumn sets in on the west side of the Cascade Mountains. I suppose we will take the good with the bad.

It has been wonderful to have great and extended transplanting weather. I have been able to place many of my recent (and numerous) acquisitions from our HFF's Annual Fern Fest. The Fern Fest marks our yearly member's meeting and a two day plant sale featuring a staggering array of ferns and a fantastic group of volunteers and board members providing helpful tips on selecting and growing ferns. The first night featured a wonderful and entertaining lecture by Martin Rickard, noted fern expert from the UK. He stirred excitement for his work on stumperies and great ferns for Northwest gardens. Thanks must be given to the chair of Fern Fest, Pat Riehl for coordinating the event and to all the volunteers who came out to help make it a success. Pat arranged for a brief live auction flush with rare plants. Thank you to Garden Vision in Hubbardston, Massachusetts for donating rare epimediums and to Asiatica Nursery in Lewisberry, Pennsylvania for donating a newly introduced rare species of *Podophyllum* (Asian mayapple).

In conjunction with the Northwest Horticulture Society Pat also arranged a phenomenal fern class featuring her newly built Victorian fern stumpery with classes given by its designer Martin Rickard. The day was filled out with additional classes on fern identification given by Sue Olsen and creating living fern tables by yours truly. The class sold out with over fifty participants and everyone had a great time and left filled with plenty of ferny inspiration.

Sue, one of our founding members and editor of the Quarterly, was recently honored for her excellent new book on ferns, Encyclopedia of Garden Ferns. The Council on Botanical and Horticultural Libraries (CBHL) has chosen to award her book with the 2008 Literature Award. This award is given to "the author and publisher of a work that makes a significant contribution to the literature of botany or horticulture". If you have not seen this book yet it is definitely worth finding. Congratulations Sue!

I am particularly interested in reading Tom Stuart's article on Pyrrosia, the felt ferns. They have long been a favorite of mine and I am always on the search for more information about these interesting and unusual ferns. *Asplenium (Phyllitis) scolopendrium*, the hart's-tongue fern, is grown in many of our gardens, but the form native to North America can be quite difficult. Joan Gottlieb helps to unlock the secrets of cultivation on this fussy variant. There is also a great species profile on *Dryopteris stewartii* from our regular contributor, Jim Horrocks. For those interested in ferns abroad, Sue Olsen, shares the trip she and a few fellow fern lovers enjoyed in Britain last year.

Unfortunately, we have lost a long time supporter and former board member. Jack Docter passed away in early June. John van den Meerendonk writes about this remarkable man and his years of service to the foundation. We will greatly miss him and our thoughts are with his family.

All the best for the summer,

Richie Steffen

President

In Memoriam - Jack M. Docter

Former Hardy Fern Foundation board member Jack M. Docter passed away on June 4th from a series of medical problems. He was 92 years old.

Dr. Jack M. Docter served as Medical Director of the Children's Hospital and Regional Medical Center in Seattle for more than twenty years. He led the Hospital from 1959 to 1981 to world renown for the care and treatment of children's diseases. Jack specialized in cystic fibrosis, which at that time was an incurable disease that afflicted many children and often led to premature adolescent death. Dr. Docter began seeing these patients when no one else would. Jack was also influential in forming the Cardio-Pulmonary Department at the hospital. Jack's easy going manner and genuine heartfelt concern made him tremendously popular with the many children who passed through the doors of this venerable institution. They just recognized that he was the nicest man and doctor you would ever want to meet.

In retirement, Jack joined the Hardy Fern Foundation serving on the Board for many years and was the Foundation's Treasurer from 1994 through 2002. Jack installed an enclosed fern garden in the back corner of the beautifully landscaped yard of his lovely home on the south shore of Bainbridge Island. He was always eager to show the various fern species he was growing and evaluating how they performed in his northwest garden. It was always a pleasure being around Jack. His pleasant demeanor and genuine interest in you, your family and what you were up to, made you feel special. I remember many pleasant conversations on our once monthly drives to and from HFF Board meetings. Jack, you will be sorely missed.

The HFF Board offers our heartfelt sympathy to Jack's family; his wife Marion (Diggs) and his children Marion, Jeff and James.

John van den Meerendonk

Dryopteris stewartii
Stewart's wood fern

James Horrocks

Salt Lake City, Utah

Photo by Richard Young. Salt Lake City, Utah.

Dryopteris stewartii is a large deciduous fern, native to the western Himalayas, east and west of the Indus River, including parts of Afghanistan, Pakistan, India, and western Nepal. It is terrestrial in growth habit, often found in open places and even near roadsides. Fraser-Jenkins reports that it "can become very large and luxuriant" in sheltered rich forests. In drier, more open places it is less developed and may be similar to more foliose forms of *D. juxtaposita*, but with more elongated pinnules. It may also approach *D. nigropaleacea*, in form but with larger, coarser pinnules. In its native habitat, it may be confused with not only the aforementioned *D. nigropaleacea* and the foliose form of *D. juxtaposita*, but also with *D. ramosa* and *D. marginata*, being intermediate in morphology. However, spore of *D. stewartii* are markedly larger than spore of *D. ramosa* or *D. nigropaleacea*. *D. marginata* is a much larger plant with fronds in a large crown-like arrangement, arising from a thick ascending rhizome. *D. marginata* is a diploid while *D. stewartii* is triploid and apogamous. Spore of *D. stewartii* are similar in size to the triploid *D. juxtaposita* but, as Fraser-Jenkins mentions, "there is normally no difficulty in distinguishing the fronds of the two." In *D. juxtaposita* there is often a dark-colored patch on the costa of the pinnae at the point of attachment to the rachis and the pinnules in the upper portion of the frond are wider and more truncate. Also diagnostic and of interest is the fact that with *D. stewartii*, in larger plants, the 3rd or 4th through the 8th pinnules on the basiscopic side of the two lower pinnae are often longer than the three pinnules closest to the rachis. This is usually not found in foliose forms of *D. juxtaposita*. To add more to the confusion, Hoshizaki mentions that in the United States trade *D. stewartii* are often actually foliose forms of *D. carthusiana*! Hoshizaki also tells us that true *D. stewartii* has been circulating in the trade incorrectly as *D. goeringiana* which is not cultivated in the United States. I obtained my *D. stewartii* many years ago from spore labeled *D. goeringiana*! Strangely, these two species are not even remotely similar in appearance. One final observation may be worth mentioning. *D. stewartii* emerges much earlier in the spring (as much as three weeks) than either *D. juxtaposita* or *D. carthusiana*.

Description: The large rhizome is erect or ascending and occasionally forms offshoots. The stipes are 1/4 to 1/2 the length of the entire frond, the stipe base clothed with elongated lanceolate, rather pale brown scales, which are scattered further up. The rachis bears very small scattered medium to dark brown lanceolate scales. The entire frond can be two and one half to three feet long in cultivation. In an ideal natural habitat they can reach upwards of four feet. The fronds are bipinnate and pinnatifid below, elongated triangular-lanceolate in outline, the lower pinnae not tapered. There may be up to 20 pairs of slightly overlapping pinnae, themselves being triangular-lanceolate, medium green and more or less hairless above. The pinnae bear up to 18 pairs of large elongated pinnules, which are stalked or have a narrow point of attachment to the costa except toward the pinna apex where they are widely attached. The pinnule segments are rounded and bear acute teeth. The apex itself tapers to a point. The pinnules on the basiscopic side of the lower few pinnae are longer and somewhat more developed than those on the acroscopic side. As has been mentioned earlier, the 3rd or 4th through the 8th pinnules on the basiscopic side of the two or even three lowest pinnae in large specimens are often longest, being longer than the three pinnules nearest the rachis. The sori are small, in two rows, one on either side, midway between the center and the margins of the pinnules. There may be two short rows of sori in the lobes of the lower pinnules. The kidney-shaped indusia are more or less flat or slightly curved downward at the edges. They are not tightly attached to the sorus unless the plant is growing in an exposed site. The indusia are thin and shrivel as the spore mature. The spores are irregular, being both fully formed and abortive. This species is apogamous.

Culture: This large deciduous fern does well in medium to even deep shade where the soil is kept damp. The upright fronds are heavy and wind is a destructive enemy. Olsen has suggested that it be grown in a mixed border where other companion plants can support it. Sandwiching it between large boulders may also work. This is a very easy fern to grow; its only drawback is its early emergence in the spring, making it susceptible to frost damage. It does not seem picky as to soil pH but it does prefer soil rich in humus. Being apogamous, it can readily be grown from spore but it takes several years to attain a large size. It is quite impressive in mass plantings.

References:

A Monograph of Dryopteris in the Indian Subcontinent, 1989, Christopher Fraser-Jenkins, Botany Series, Vol. 18 #5, British Museum of Natural History, London

Encyclopedia of Garden Ferns, 2007, Sue Olsen, Timber Press, Inc., Portland, OR

Fern Growers Manual (Revised) 2001, Barbara Joe Hoshizaki and Robbin C. Moran, Timber Press, Portland

Hardy Pyrrosia

Tom Stuart

Croton Falls, NY

The Genus

Pyrrosia is an Old World genus of small to medium-sized polypods, mainly tropical, mainly epiphytic, and mainly with simple, entire fronds. All of these characteristics have exceptions.

Peter Hovenkamp's 1986 A Monograph of the Fern Genus *Pyrrosia* reduced the number of species from over a hundred to fifty-one. It also subsumed several genera into *Pyrrosia*. He brought coherence to a chaotic group.

Pyrrosia is distributed from the West Coast of Africa to Madagascar, to India, across the Himalayas, northeast to Russia, southeast into Malaysia, Australia, and on into the Pacific as far east as the Pitcairns. Henderson Island, almost directly south, far, far south of Juneau, is the easternmost outpost with *Pyrrosia serpens*, epiphytic on *Pisonia grandis*–a tree in the four o'clock family and dominant on the island. Henderson Island, a coral mount, is inhabited by nine ferns, 54 seed plants, occasional typhoons and no humans. Among the other ferns are the bird's nest, *Asplenium nidus*, epilithic on limestone outcrops or again as an epiphyte on *Pisonia*, the whisk fern, *Psilotum nudum*–leafless and rootless as ever, but strictly terrestrial here, oddly never on trees as elsewhere,– the giant hare's-foot fern, *Davallia solida*–again epiphytic in *Pisonia* forests–and two *Nephrolepis* species–both rock-dwellers.

At the western end of the *Pyrrosia* range, the species is *P. schimperiana*. With an African distribution centered on the equator it is native to half the continent. *P. schimperiana* is principally an epiphyte, but also found on exposed or lightly shaded rock outcrops. In between *P. schimperiana* in Guinea and *P. serpens* on Henderson–15,000 miles–are 49 other epiphytic or epilithic felt ferns.

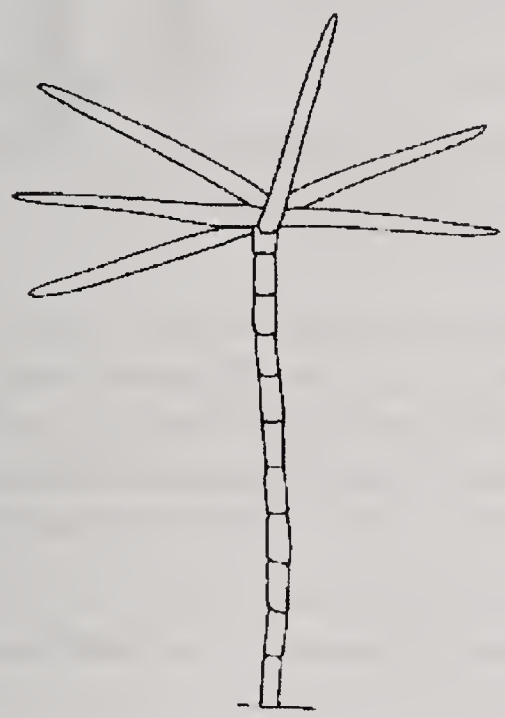
What makes a *Pyrrosia* a *Pyrrosia*? Among other characteristics, simple leaves.

They can be quite varied in outline; here is *P. abbreviata* of Sumatra and Java. Besides many frond shapes we see a typical rhizome, this one long-creeping. Some species are short-creeping, branching, and congested. The long-creepers like this are slow to form good specimens. All pyrrosias have hard, dense, often brittle rhizomes. These have a high composition of sclerenchyma cells. Sclerenchyma are dead at maturity, composed solely of thick cell walls; tree ferns have a lot of sclerenchyma, too. Sclerenchyma is sparse in other polypods, except for *Platycerium*. That's another story. Sclerenchyma morphology is of diagnostic help for a taxonomist, but not for you and me.

The rhizome (lower left) is always covered with scales (upper left). These scales differ greatly species to species as to attachment, size, shape, and margins. You can

use these diagnostically with a hand lens and a description or key. Though scales on rhizomes are not accessible on many ferns, since they subterranean, *Pyrrosia* rhizomes are mostly just touching or barely immersed in the substrate.

Of course all polypods have naked sori, and *Pyrrosia* is no exception. Most species also have round sori as with the majority of polypods; sometimes they are elongated or multiple sori are fused into long chains.



A particularly distinctive characteristic of *Pyrrosia* is stellate hairs, shown schematically here. All *Pyrrosia* have these hairs, sometimes two kinds or two layers. Most often they are sparse on the upper surface and dense on the lower surface. The dense mat below gives the genus its common name. You can see these hairs with a hand lens, though sometimes they are only evident on young fronds. They vary from one species to another in color–white, translucent, tan, or red– or form–needle-like or boat-shaped or wooly rays.

Platycerium also have these hairs. Yes, another story.

In addition some *Pyrrosia* have excretions of calcium on the upper surface. These are visible as white dots called **hydathodes**. Hydathodes are found on other ferns, but not commonly, so it is a good indicator character. To round out the indument description, scales are never found on the frond, only on the rhizome.

Two other characters are useful for their exclusionary value: **venation**: always netted, but quite varied in details and often obscured; **phyllopodia**: (stump-like extensions above the rhizome to which the fronds are jointed) are always present–common in the Polypodiaceae–and are covered with the same scales as the rhizome.

Visible characters of little value in identifying the genus: **the stipe**: none to longer than the lamina; **frond dimorphism**: some *Pyrrosia* are monomorphic, some slightly dimorphic, others strongly so; **paraphyses**: (indument–here always stellate hairs–within the sorus) vary from undifferentiated (compared to nearby hairs) to slightly modified to absent. One needs a hand lens for this last character.

Lastly, the **felt**. A majority of the species do exhibit a feltiness in one degree or another, but there are plenty of exceptions. For example, *P. piloselloides* of Southeast Asia, China, Japan, and Sri Lanka is succulent. Though it has sparse stellate hairs on emergence, they soon fall, and one is left with a shiny surface. The felty texture has two origins. The fine hairs, particularly when they include wooly ones, can support a felt description on their own. However, the lamina in most *Pyrrosia* species is not at all two-dimensional–as in *P. piloselloides*–but cobbled or pebbled; I think this light-scattering surface is contributory.

To sum up, even if you are not a pteridologist, you can distinguish a *Pyrrosia* because it

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Hardy Pyrrosia *continued from pg. 51*

has creeping, surface-dwelling, scaly rhizomes, simple fronds jointed to the rhizome, naked sori, stellate hairs, and sometimes possesses hydathodes. This combination of characters is unique.

Our title is Hardy Pyrrosia and so far there have been only tropical ferns. Diversionary tactics are over. Time to focus.

Temperate Pyrrosia

Originating in the tropics, the genus speciated northwards into subtropical and temperate areas of eastern Asia, that is, China, Japan, Korea, and Russia. Some of the temperate species are not in cultivation.

We start with *Pyrrosia linearifolia*, known from Taiwan in the south, northwards on all of Japan's islands, to Korea, and on into Manchuria/Jilin. A vigorous, short-creeping fern with fronds no more than four inches high, it is very felty on both surfaces with evident hydathodes above. Two kinds of stellate hairs can be seen: an upper layer with needle-like rays and a lower layer of wooly ones. *P. linearifolia* can be found on both trees and rock.

Is the material in cultivation from Taiwan or Manchuria? Having just looked at my test in the garden here, I'm leaning towards the former. Taiwan is zone 8 or 9. Manchuria is zone 5 or 4. Provenance is important. Sometimes.

P. lingua, the tongue fern, is so-called because someone thought the frond looks like a tongue. Not to me. The fronds rise a foot, typically, though can be much shorter, and are leathery above, tan-felt below, aging to orange, but not always. Stipes are up to half the frond. The rhizome is long-creeping, typically 1-3" between fronds, and branching modestly. Growth rate is moderate. On the upper surface stellate hairs are irregularly scattered and hydathodes are widely spotted. As usual in the genus, the hairs are denser on the lower surface. The sori are in a patch, not quite merging at maturity, either at the apex or all over. Fertile fronds are infrequent.

P. lingua is the most common *Pyrrosia* in gardens, frequent enough in zone 7-8 ferneries. Most gardeners stick it in the ground and ignore the epilithic or epiphytic habitat in nature. Cultivars of this species abound, especially in Japan. The nursery Asiatica has several.

Based upon its distribution in eastern Asia, as far north as southernmost Korea and southern Japan, it ought to be successful in zone 8 and borderline in zone 7. That is what is seen in gardens in eastern North America. However, there is a taxonomic variety encompassing all the territory from Vietnam northwestward and extending on to the Tibetan Plateau. Var. *heteractis* gets its name from the possession of two types of stellate hairs; *heteractis* means multi-rayed. It should be hardy to zone 5 or 6. It does not seem to be in commerce here, though Hoshizaki reported it in 1981 (under the name *P. heteractis*) as coming from northeastern India, Burma, and southern China and not as robust as *P. lingua*; clearly this was not material from Tibet.

Pyrrosia hastata and *P. polydactyla* share many similarities including being the only exceptions to simple fronds. *P. hastata* is hastate, *P. polydactyla* is digitate. The former is native to southern Korea and southern Japan. The latter is endemic to Taiwan. Both are modest in size, under a foot, clumping, moderate in growth rate. They have monomorphic fronds with scattered hydathodes and a dense, persistent mat of boat-shaped rays. The sori are sometimes at the apex, sometimes all over. Both are very soft felt. Both are principally found on rock, less often on trees. Hovenkamp reports that when they are grown in identical conditions they tend to look like each other. Though some microscopic characters weakly support separate species, it appears the most important support comes from different distributions. He concludes more study is needed to determine whether the species level can be maintained. This might explain, too, why some photos on the web appear to be misnamed. Whatever the appellation, you want to touch them all over.

I had *P. hastata* come through a winter in zone 6, albeit reduced in vigor. Perhaps in a drier site it might fare better. In any case zone 7 seems likely. For *P. polydactyla* I can find no evidence for other than zone 8. Of course we'd like to hear otherwise.

Pyrrosia eleagnifolia is the only temperate species outside of cool Asia: the Himalayas or the east coast. Found in New Zealand and two Pacific islands, its habitat is epiphytic or epilithic, rarely terrestrial. Long-creeping, slow growing and long-lived, it can–with sufficient time–clothe, then suffocate large trees. Stipes are short. Fertile fronds are linear to 5" long; sterile ones shorter, tending towards pear-shaped. No hydathodes. Fawn colored hairs with narrowly boat-shaped rays form a dense mat on the lower surface.

P. eleagnifolia likes dry conditions, grows on coastal rocks as well as high in trees, and has a reputation for difficulty in establishment. Hardiness has been rated as zone 9, but it appears to grow in areas classified as zone 8.

Pyrrosia petiolosa is possibly the hardiest of all *Pyrrosia* and is not in cultivation. It is a small fern, not exceeding 8", often a good deal less. Closely related to *P. lingua*, it is, besides smaller, more leathery, and has more confluent sori. It is used in China as tea and as a medicinal. Despite these economic uses, I can find no evidence of cultivation. It is almost exclusively epilithic, perhaps very much like several temperate *Polypodium* species.

P. petiolosa in its southernmost distribution near China's border with Vietnam is subtropical, but extends northeastward to embrace Korea, Manchuria/Jilin, Inner Mongolia, and Russia's far east. Based upon distribution, some territory is at least as cold as zone 4.

Continued on page 54

Hardy Pyrrosia *continued from pg. 53*

Pyrrosia porosa has an even wider distribution than *P. petiolosa*, extending from Sri Lanka eastward to the Philippines in tropical territory and north to the Himalayas, Inner Mongolia and Japan. Its colder sites are perhaps zone 4 or 5. In northern areas it is likely only epilithic, but is found on trees in the tropics. Fronds to one foot, without or with an indistinct stipe. The brown stellate hairs are both needle-like and wooly. Sori are closely packed, but not merging. *Pyrrosia* is Shiwei in Chinese; the name for *P. porosa* is Soft Shiwei.

Pyrrosia davidii is submerged in *P. porosa* by Hovenkamp, but is recognized in the Flora of China and seems to occupy the northern areas attributed to *P. porosa* in the monograph. (To add to the confusion, it is *P. pekinensis* in the Flora of Japan.) *P. davidii* is common on Chinese and Japanese web sites, far more so than *P. porosa*. A crested form of *P. davidii* with no resemblance to the species is offered by Asiatica; otherwise the species, no matter what the name, does not appear to be in commerce in North America.

Speaking of web sites, the last year has seen an explosion of plant photos from China. One with scads is the Chinese Virtual Herbarium, http://cvh.ac.cn. However, excepting the Latin names, it is entirely in Chinese, so a bear to navigate. Use Google to zero in on your target.

By all that is right and proper *Pyrrosia sheareri* does not qualify as hardy based upon its distribution in southern China, at best zone 9. However, I've seen it in a garden in eastern Germany, a garden which must be either zone 6 or 7; Sue Olsen reports survival at 10°F. *P. sheareri* is epilithic by preference, epiphytic at times, possibly the largest of the genus, and distinguished by a long stipe, up to half the frond, with a distinct white-to-yellowish midrib. Needle-like stellate hairs on the leathery upper surface are quickly shed, but a mat of hairs on the fuzzy, tan lower side stays in place. Hydathodes are scattered over the lamina; sori are in an ill-defined patch. The rhizome is short-creeping and frond production is **slow**. Plants grown in warm conditions appear more robust and can exceed two feet.

Growing Pyrrosia

Are you a patient grower? If not, stop right here.

Surely the tortoise-like growth of *Pyrrosia* species is a factor in its absence from the horticultural pallet. The time it takes to produce a respectable plant requires a price few buyers are willing to pay. An exception in the group above is *P. linearifolia*, a moderate grower.

This is particularly disadvantageous with long-creepers like *Pp. eleagnifolia, lingua, petiolosa* and *sheareri*. They take time to fill in and have a scraggly appearance until they do.

Slow frond production has another disadvantage in cold climates. Fronds are not as hardy as rhizomes; they are more likely to fail to survive winter. If new frond generation does not keep pace with frond senescence, the plant will dwindle. Here in zone 6 of northeastern North America there is not a single native fern that has fronds lasting 12 months, including every one of the so-called evergreen ferns. Ferns adapted to this climate, however, produce with sufficient vigor to outpace this leaf death rate. *Pyrrosia* species appear to me to have leaves with a natural lifetime of more than one year, even a few years. Growing them

in a colder climate than the one where they evolved is thus unlikely to be rewarded with long-lasting specimens. When it's too cold for a thriving specimen, all the temperate *Pyrrosia* make fine houseplants.

If you've come this far, then the rules are very simple: good drainage, good drainage, good drainage. Grow them in a basket, grow them mounted, grow them on rocks, grow them on other plants, grow them in pots, or, if you must, grow them in the ground. In the last case, it should either be on sand (there are a few tropical species found on sand) or on a slope, the steeper the better. In a climate with wet winters, additional efforts in behalf of drainage or overhead protection are advisable.

All the species are drought-tolerant. That granted, none are found in deserts. They inhabit the wet tropics (in some cases with dry seasons) or moist subtropical to temperate climates. If you are situated in such an area, there is presumably little need to provide supplemental water. The exception, no surprise, is in establishment. Summary: in dry climates or when establishing a new plant, water it.

When planting note that roots are initiated only at the growing tip of the rhizome. When new roots do not find amenable surroundings, they immediately abort. They are never initiated later, though a branch may develop with subsequent root development on the newly extending rhizome offshoot. So, submerging rhizomes in moist media may lead to rot, but not to root production; it is only the tip that matters.

Disease: none encountered. Insects: occasional minor scale infestations; treat with rubbing alcohol. I use the commercial 70% product diluted to half strength. In the wild one species has been observed as the subject of sawfly galls, which form on the sorus.

As a consequence of their slow growth *Pyrrosia* are costly and there aren't many sources. For the species above the most likely sources are Garrie Landry (2512 Chatsworth Road, Franklin, LA 70538) and Plant Delights Nursery (241 Sauls Road, Raleigh, NC 27603). For the unusual cultivars imported from Japan try asiaticanursery.com. I've also found a couple on eBay.com.

If you have had hardiness experience with *Pyrrosia*, drop me a note.

Tom Stuart, tstuart@westnet.com

Barbara Joe Hoshizaki, "The Genus Pyrrosia in Cultivation," Baileya, 21:53-76 (1981). Silhouettes of *Pyrrosia hastata* and *P. polydactyla* used with permission.

Peter Hovenkamp, A Monograph of the Fern Genus Pyrrosia, Leiden University Press, Leiden, 1986. Illustrations from the monograph used with permission.

Growing the American hart's-tongue Fern

(*Asplenium* [*Phyllitis*] *scolopendrium* var. *americanum*)

Joan Eiger Gottlieb - Pittsburgh PA

During the 1991 centenary of the British Pteridological Society I wallowed in an abundance of 'scollies,' the term of endearment Brits apply to the many existing forms of their hart's-tongue fern (***Asplenium scolopendrium* var. *scolopendrium***). This European variety is diploid (2n=72), having two complete sets of chromosomes, and it is widespread in northern Europe on shaded limestone and rubbled rock walls. During the 'pteridomania' of the Victorian era (1840's to early 1900's) fern seekers collected, and often extirpated, many sports (mutant forms) of this fern in the wild. Propagators soon had a sizable array of crisped, cristate, undulate, fimbriate, muricate, sagittate and other 'frondly' embellishments to offer as cultivars in the commercial trade. You can see exquisite photos of some of the best 'scollies' in Sue Olsen's *Encyclopedia of Garden Ferns*[1]. Many of the forms are stable in cultivation, but some revert to the wild look after a few years. Hardiness varies considerably and few types come true from spores. '*Phyllitis sagittata*,' reported as a rare species from Mt. Gerizim in northern Israel[2], may, in fact, be one of the arrowhead-shaped leaf mutants that occurs spontaneously in European hart's-tongue, an occasional find in old cisterns, cave openings, and karstic sinkholes in Israel and Lebanon.

Mature, fertile American hart's tongue- fern on tufa; photo courtesy of Don Avery, Cady's Falls Nursery, Morrisville VT

In contrast, the American hart's-tongue (***Asplenium scolopendrium* var. *americanum***) is tetraploid (4n=144), with four complete chromosome sets. It is quite rare, occurring sporadically in North America on shaded, moist, dolomite or on the ground in alkaline, hardwood forests in Ontario (Bruce Peninsula), Michigan (Upper Peninsula), and western New York (Niagara escarpment). Disjunct populations exist in eastern Tennessee, northern Alabama, and northeastern Mexico (Nuevo León). According to Dr. Alan R. Smith[3] of The University Herbarium at Berkeley, '*Phyllitis lindenii*,' found on Hispaniola and in southern Mexico (Oaxaca, Chiappas), is "likely a tetraploid, indistinguishable from the American hart's-tongue." '*Phyllitis japonicum*' is "merely the East Asian variant... and has the same chromosome number as the American plants." There are no reported sports of the American hart's-tongue - perhaps a restriction connected to their tetraploid genotype.

Short of counting their chromosomes; distinguishing between American and European hart's- tongue ferns is a frustrating exercise. Average differences in frond size, leaf tip attenuation, scale width, midrib hairs, soral distribution, et al were described by M.L. Fernald in 1935 and are listed in *Flora of North America*[4]. However, there is considerable overlap of these characters between the two varieties. Their morphologies also are affected by light, minerals, pH, and other environmental conditions (not to mention the pampering of garden specimens). In Ontario, Canada one can travel up the Bruce Peninsula, which juts into Lake Huron where near the base of the peninsula the American hart's-tongue is scattered on alkaline soil in mature maple forests. In this habitat the plants form prostrate rosettes of small, broad, dark green fronds. Farther north the same fern grows on dolomitic limestone ledges that resemble stadium benches and risers. Under a light, woodland canopy, crowded colonies of hart's-tongue are packed into rock crevices. They look like sentinels at full attention, with impressively tall, slender, lime-green fronds. The plants in both locations are liberally fertile, bearing linear sori in paired rows perpendicular to the midvein. The sori are restricted to the distal ends of some fronds, but other leaves are fertile down to their cordate (heart-shaped) bases.

Quite possibly we are looking at one variable species with widely isolated populations that are responsive to their environment and are evolving into subspecies, producing sports (at least in the European variety), and perhaps eventually becoming new, reproductively separate species. Dr. Smith[3] advises *Asplenium* (rather than '*Phyllitis*') as the 'correct' generic umbrella for the hart's-tongue fern since it shares an ancestral history with about 700 other species grouped within *Asplenium*. Also there is hybridization and backcrossing among many species of *Asplenium*, including the hart's-tongue. This reproductive congruity is considered evidence of taxonomic unity (see Mickel and Smith[5] for a more complete treatment).

Martin Rickard[6] says, "The robust character of the European hart's-tongue fern makes it one of the very best garden plants." I would proffer the American variety as equally worthy, even more hardy, and certainly deserving of greater garden use in view of its precarious status in the wild. In my garden the first fertile fronds to emerge in the spring produce spores that can be harvested at the end of July. Subsequent collections are possible until early fall. Spore cultures are easy on commercial 'seed starter' (a soil-less mix of peat moss, perlite, bark and a wetting agent) tossed with a little agricultural lime, although I am not convinced the lime is needed.

After sporelings produce their second fronds the plants can be lifted carefully (do not attempt to tease out individuals; small clumps are fine) and spaced out in well-drained communal containers newly prepared with a bottom layer of good quality compost, overlain by a little seed starter, and thoroughly moistened. Scatter a few, clean limestone chips between the plants and water sparingly, as needed, with a very dilute solution of liquid fertilizer. Plastic covers are needed to maintain the high humidity in which the young plants developed. When new fronds are over an inch tall the cultures are ready for hardening. Remove or lift the plastic covers for successively longer periods each day, watching carefully for signs of wilting. Two to three inch plants can then be set into the garden in the spring. If pecking birds or digging rodents are present, an inverted wire basket will protect the transplants until their roots are well established. Select a shaded site on a slight

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Growing the American hart's-tongue Fern

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slope (for good drainage). If the soil is acidic you will need to work crumbled marble, limestone chips, or crushed eggshells and seashells into the ground after it has been cleared of all weeds and enriched with compost to a depth of six inches. Chunks of concrete rubble and limestone rock should be 'planted' at close intervals. Allow the prepared cobble to settle and naturalize over a winter (site preparation is best started as soon as the first sporelings appear in the culture containers). In the spring, nestle in well-hardened hart's-tongue plants. Add more compost as needed and set up a slug watch. Use control measures if necessary. Hart's-tongue is subject to root rot from excessive soil wetness, so water new transplants only as needed to keep them from drying. (*Ed. note...also be on the alert for root weevils, which will happily notch the fronds.*) A healthy colony of this choice fern will reward your efforts, and other calciphiles can be added, including walking fern, eastern maidenhair fern, Robert's oak fern, European hart's-tongue (as well as a sampling of its choice cultivars), assorted hellebores, and twinleaf.

The biggest problem is acquiring starter spores. Spore exchange sources are frequently miss-identified and most available material is of European origin. Everyone who has access to garden plants of the American hart's-tongue fern is urged to send spores to the Hardy Fern Foundation spore exchange. I plan to be among the contributors. Re-'fernishing' appropriate sites with the remarkable American variety is a worthy gardening goal. Gathering wild, adult plants risks damaging or destroying dwindling natural populations. Experienced naturalists have tried moving specimens from areas about to be quarried, with little or no success. Spore grown, young plants suffer less trauma when transplanted and acclimate more easily to new sites. Perhaps, in time, nurseries will offer such plants, and we can all wallow in American hart's-tongue in our gardens.

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Best of Britain

Sue Olsen

Bellevue, WA

When Martin Rickard offered to take four of his American friends, Wim and Naud Burnett, Pat Riehl and me on a pre-arranged tour of the gardens at Highgrove, the estate of HRH Prince Charles, little did he realize that he had just volunteered to escort us on a two week tour of fern gardens in the UK, a role, I might add, that he performed most successfully. It was two weeks of special ferning and here are some of the highlights.

Day one, which was the visit to Highgrove, was the predetermined focus of our trip. As a condition of visiting, however, taking photographs and offering written accounts of the garden are not permitted. I think, however, that I will not be violating the agreement by acknowledging the generally well known fact that Prince Charles is an organic gardening enthusiast and as many fern aficionados also know the garden features an elaborate stumpery which we saw and enjoyed.

Our entourage then headed west to Wales for a visit to Dryffryn where with supplies from Martin's nursery, ferns cascade down and across a slope designated specifically to showcase appropriate settings for British ferns and their cultivars. Dryffryn is far more than a fern garden, however, and we greatly enjoyed a tour of their showcase property. Especially impressive for me was a site that had only recently been immersed in floodwaters, but had been promptly restored to elegance.

We next headed for Dewstow, a unique site combining caverns and grottoes that house ferny splendors and offer a fascinating array of pteridophyte wonders. (Watch for a comprehensive article describing this interesting site in a future Quarterly.) We rounded out the day with a brief visit to Martin's garden and his collection of *Polypodium* cultivars plus selected favorites including a fertile and photogenic *B. magellanicum*. In addition to ferns, Martin has also researched the related literary world and acquired an outstanding library that could occupy enthusiasts for months. We did our best in the time allotted.

This entire schedule was designed to dovetail with the British Pteridological Society's study weekend in Wales and it was with great "joy" that while en route we were thus able to visit the garden of Joy and Stuart Neal. Ever the gracious hosts, they provided a sumptuous lunch of salmon freshly caught from the waters that grace their property. For dessert, Joy shared the delicacies of her fern garden. Of the many treasures we especially enjoyed a lush group planting of assorted blechnums that included the green *B. nudum*, red *B. minus* and *B. novae-zelandiae* and one that some Seattle folks I know aspire (lust) to introduce to our gardens, *B. discolor*.

Wonderfully enriched we made our way to our weekend headquarters in the charming seaside village of Criccieth and to special greetings from our BPS colleagues. Next day an early morning beach walk provided the sighting of an unscheduled delight, *Asplenium obovatum* subsp. *billotii*, secured in an inhospitable rocky crevice. I was delighted with the find and it reminded me of how I am continually impressed with the resilience of the aspleniums in their challenging habitats. This was no exception.

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The planned weekend activities offered several options for touring. Portmeirion, probably more familiar to most of us for exquisite china than for flora, was the morning stop. Having once visited the china center I was totally unprepared for the "real" Portmeirion, which is at the waterfront away from the town. Created by Clough Williams-Ellis between 1926 and 1976, it is a full-scale replica of an Italian village with pastel homes and shops and yes, china, as well as a few ferns along the trails to capture the attention of visiting pteridologists.

The afternoon options included a stop at John Sanford's to view his extensive tree fern collection as well as an excellent tour of the hillside garden of William Hughes with its magnificent assortment of the rare and unusual. It was a late day highlight and one of my many favorites was his undulate form of the stunning *Woodwardia unigemmata*.

The weekend activities concluded with visits to two nurseries, always a popular pursuit. Rickard's Hardy Ferns, Martin's former enterprise, now rechristened as the World of Ferns and relocated in the woodlands of Wales was our first stop. (Fortunately Martin knew the way.) Here in numerous greenhouses were large plants of their extensive and varied inventory. Sales tables offered both large and small plants many of which were soon to find new homes.

Aberconwy Nursery, our next stop, near Colwyn Bay offered a magnificent collection of beautifully presented alpine plants of all types including choice ferns. Visual delights that I found especially impressive included their polypodiums as well as rare and healthy xerics. They too found new homes.

One of the many highlights of our trip (and there were many) was the visit to our next garden, that of Dr. Michael Hayward. Michael enjoys great success in growing ferns from spores and as a result has amassed an interesting and lovely assortment of species and cultivars from around the world from small aspleniums to large tree ferns. Unfortunately a serious rainstorm halted our meandering. However it gave us a chance to enjoy his conservatory and to see some of his impressive fern oriented art collection.

Robert and Sue Sykes live in a charming old home with a delightful pastoral view in the Lakes District. Before heading to the garden we were treated to a delicious lunch of homemade soup and bread as well as some of the most beautiful strawberries I've ever seen. Robert's fern collection features many *Polystichum* cultivars. However, it was an *Athyrium* that captured everyone's attention. Aptly described and named as 'Red Lance' by Robert, it is a bushy, tall *filix-femina* 'Frizelliae' with red stipes and rachises challenging our US 'Lady in Red' for structural brilliance. It is a progeny of 'Angustata'. (Regrettably I must add that like most *Athyrium filix-femina* cultivars it does not come true....or even close....from spores.)

We headed for Edinburgh with a brief stop at the garden of Robert Crawford to see tree ferns proudly grown in his harsh climate. (It should be mentioned that tree ferns are one of Martin's passions.) At Edinburgh Botanical Garden I was thrilled to finally see the true *Polystichum squarrosum* as well as many, many plants of *Blechnum cycadifolium*. Unfortunately garden policy forbids gifting even so much as a tiny pinnule so none of the material could be shared..

Moving on, our subsequent tour at the Glasgow Botanical Garden was delightful. Steve, our guide, kindly and enthusiastically shared his knowledge while treating us to a personal tour. Special mention must be made of their stunning and newly remodeled Kibble Palace glasshouse and the dedicated attention to growing a forest of tree ferns within. Other specialized environments presented an interesting and exciting collection of filmy ferns as well as selaginellas. It was a wonderful and educational experience as was our subsequent visit to the garden of Alastair and Jackie (who always provides a delicious meal) Wardlaw also of Glasgow. I had been there before and was once again looking forward to seeing their magnificent collection. It is no accident that Alastair has the National Collection of Ferns a well-deserved honor. He, like the German specialists, is one of the most dedicated growers I've ever met, tending to his ferns with detailed devotion and scientific respect for their preferences. Consequently, there are filmies lushly sited in sunken beds with protective plastic covers, abundant numbers of tree ferns (mind you this is outdoors in Glasgow) tended with winter wraps, as well as xerics tucked into walls and tube fed via an elaborate system that begins with inserting pop bottles into the area surrounding the proposed planting site. (See the descriptive article 'Cavity Wall for Growing Rock Ferns' in the HFF Quarterly, Volume 17, #4, Fall 2007.)

Blechnum in the Wardlaw garden.

As the day waned we continued on to the coastal village of Port Patrick, an absolutely delightful town with an award winning seafood pub. We enjoyed both immensely. It was from there that we visited Logan Botanical Garden which, aided by the Gulf Stream warmth, is a haven for ferns which otherwise would not be considered "hardy" in the UK. Tree ferns, unprotected during the winter months, were dominant, but there were other borderline species, including pyrrosias and blechums that were obviously comfortable in their seaside site.

After a scenic drive over the Pennines we were hosted in the vicinity of York by Anne and Barry Wright known to many of us for their years of serving as dedicated curators of the BPS spore exchange. Following a traditional British meal, steak and kidney pie, we toured

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yet another interesting garden with an array of unique species and cultivars. The polypodiums and their cultivars were of particular interest and they generously sent some of their unusual types home with us.

Still in the York region we visited the extensive garden of Sylvia Medd. Hers is a garden on the UK open garden scheme and she sometimes hosts up to 600 visitors a day. So, as a modest group of five it was a privilege to tour the lovely garden, (which had amazingly been flooded just several weeks earlier), as well as to visit the behind the scenes propagation operations.

Martin was then to travel to France and he left us in Alvechurch (near Birmingham) in the capable hands of Alan Ogden and his wife Val. Here we were treated to a garden tour with yet more unusual plants, the special feature being Alan's *Drynaria sinica*, well established after several years of varying degrees of exposure. With our journey approaching its end the Ogden's kindly provided some excellent meals and graciously indulged (with a bucket brigade) our need to wash plants for their homeward journey. Alan continued as chauffer for our forays serving as tour director for our last days. The visits included a personal tour of the extensive and ever expanding fern collection at Fibrex Nursery, which produces hundreds of usual and unusual ferns for the UK market. (Interestingly enough, pelargoniums [geraniums] are their other crop.) For fern lovers, it is a must visit and impressive operation.

The Biddulph stumpery.

From there we progressed to the grand finale, which featured two outstanding gardens. As many of my friends know, I'm a xeric fan, so it was a delight to once again visit the garden of Clive and Doreen Brotherton. I first visited many years ago and was amazed to see so many healthy "dryland" ferns growing so successfully in central England (which is know to be "moist"). I think Clive has one of the best xeric gardens I have ever seen and it is always inspiring and educational to visit his collection.

The other treat was Biddulph Grange known as a garden with many unusual features, but of particular interest for us a fern stumpery. It is old, perhaps the oldest deliberately constructed such structure in the world. Whatever the pedigree, it is a remarkable piece of garden architecture and is comfortably furnished with ferns and companions well established over the years to give a "lived in" look.

I extend our thanks to the many folks who shared their gardens, plant knowledge, enthusiasm and hospitality - including culinary treats. I especially send my thanks to Alan and Martin for their time and guidance. And just as a note I'd do it again tomorrow :).

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