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THE HARDY FERN FOUNDATION

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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 Stephen Austin Arboretum, Nacogdoches, Texas, 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, Lewis Ginter Botanical Garden, Richmond, Virginia, 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, Lakewold, Tacoma, Washington, Les Jardins de Metis, Quebec, Canada, 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.

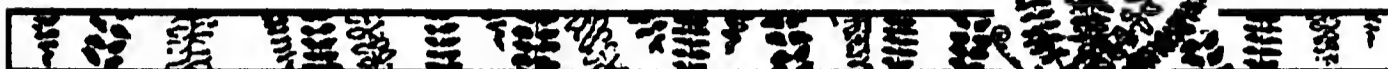
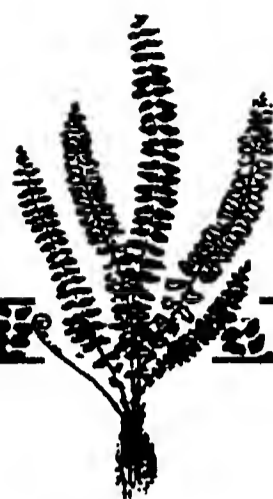
Cover Design by Willanna Bradner

HARDY FERN FOUNDATION QUARTERLY

THE HARDY FERN FOUNDATION

QUARTERLY

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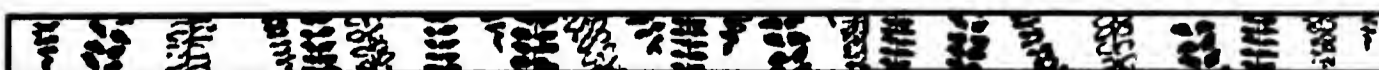
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The Spore Exchange Needs You

Please continue to send spores to:

Shannon Toal
4717 SW Graham Street
Seattle, WA 98136



Spring 2001

Pat Kennar, President Elect

Six weeks ago the "Groundhog" gave his opinion indicating spring would arrive at the usual time. Credibility notwithstanding, he overlooked an earthquake, a Fat Tuesday riot and an incredible shortage of rainfall.

In spite of these obstacles, we should have a promising spring. Hopefully leafhoppers and slugs will be kind and forgetful.


The 2001 Northwest Flower and Garden Show in February brought us success in the form of an Award of Merit for an Exceptional Educational Exhibit. Thank you all for your support and involvement especially Michelle Bundy and Becky Reimer for superhuman effort and creativity. During my tour of duty, there was a continuous flow of compliments concerning the visual appeal of the display. (The public especially enjoyed a planted arrangement of spiked fertile *Matteuccia struthiopteris* fronds!!!) It sounds as if plans are under way to surpass this in 2002.

We are excited about the prospects of a very successful and rewarding Fern Festival in June. We are making a special effort to enlarge the scope of our venue by increasing the varieties and inventory of available ferns, companion plants and mosses.

As a reminder the dates will be Friday June 1, 2001 with the plant sale from 1:00 – 4:00 and a brief meeting at 6:30 followed by a lecture, "A Garden Stroll Through China" by John van den Meerendonk. The sale will continue on Saturday June 2 from 10:00 – 2:00 with a propagation clinic at 11:00.

We can always use help in set up, sales support and take down after the festival. Please contact Michelle Bundy at (206) 870-5363 or e-mail at sabina98@earthlink.net. to schedule a convenient time.

Again I thank those who worked so diligently on insuring that our Flower and Garden Show display was a prize-winner and perhaps the best so far. We look forward to seeing you at the Fern Festival.



THE HARDY FERN FOUNDATION
QUARTERLY

The Hardy Fern Foundation Quarterly is published quarterly by the Hardy Fern Foundation,
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Articles, photos, fern and gardening questions, letters to the editor, and other contributions are welcomed!

Please send your submissions to
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Bellevue, WA, 98005.

Newsletter:

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Graphics: *Willanna Bradner (cover design)*
Karie Hess (inside design)



Award winning HFF display at the Seattle Flower & Garden Show.
Photo by Pat Kennar.

New Members

Memorials

In memory of
Ralph Wilen

Joan and Milton Gottlieb

Rollo and Winni Adams

Coastal Maine
Botanical Gardens

William Crowell

Helen Denzler

Dr. Cathy H. Donaldson

Eve Hayes

Prudence Holliger

Albert Jordan

Rebecca Randall

Steven J. Royer

Shirlee Simon-Glaze

IT'S A CYSTOPTERIS

C. tenuis or *C. fragilis*

by the late Ralph Wilen

1803 - Named *Cystopteris fragilis*, variety *mackayi*

1827 - Given species name - *C. tenuis*

1889 - Returned to variety - *C. fragilis* var. *mackayi*

1993 - Returned to species status - *C. tenuis*

NOTE: In all quotes in this article I have changed 'variety *mackayi*' to '*C. tenuis*', as the two names only add confusion.

We have had many interesting discussions on many field trips concerning the identification of *Cystopteris fragilis* vs. *C. tenuis*. If we study a dozen books, written over the last century, will we find time and recorded experience constantly building toward a clearly defined identification of each? Will this help us to make this seemingly simple field identification with confidence? Let's give it a try and look at some of the fern field guides:

Willard N. Clute in Our Ferns in Their Haunts, 1901, gives us an easy way to solve our problem when he writes of *C. fragilis*, "Several varieties have been named but none of them are very striking and little attention is paid to them."

Edith Scamman in Ferns and Fern Allies of New Hampshire, 1947, writes of *C. fragilis*, "It is one of the most variable and unstable ferns in the shape and cutting of the pinnae. "She goes on: "Variety *tenuis*: the narrow bases and broad apex of the pinnae-divisions are characteristic of this variety." And in her key: "The secondary divisions oblong to obovate, cuneate [wedge-shaped] at base, obtuse at apex, slightly lobed."

Edith B. Ogden in Ferns of Maine, 1948, writes of *C. fragilis* in her key to cystopteris: "Most secondary divisions not especially rounded at tip, at least those nearest rachis of lowermost pinnae not much narrowed at base; indusia elongated, deeply lobed at narrowed tip, usually easily seen in mature specimens." And of *C. tenuis* she writes: "Most secondary divisions more rounded at tip, at least those nearest rachis or lowermost pinnae rather evenly narrowed at base; indusia usually shorter, less deeply lobed or even entire at upper edge, not easily seen in mature specimens."

Cecil Billington in Ferns of Michigan, 1952, writes of *C. tenuis*: "Base pinnules cuneate at the base and broadly rounded at the summit."

Rolla Tryon in Ferns of Minnesota, 1954, writes in his key, which was adapted from Weatherby, *Rhodera* 37:325, 1935; which writes of *C. fragilis*: "Indusium rather large, up to 1 mm. long, more or less cleft at the apex; basal pinnule-segments broadened at base, not evenly wedge-shaped." And of *C. tenuis*: "Indusium about 0.5 mm. long, entire or only shallowly cleft; basal pinnule-segments evenly wedge-shaped at the base."

In Ferns of Tennessee, 1954, by Jesse M. Shaver (Mr. Shaver discovered, described and named *Cystopteris tennesseensis*.) :

“The following key, slightly modified from one given by Weatherby (1935), will usually separate these forms and varieties.

“*C. fragilis* - Indusium relatively large, up to 1/25 inch (1 mm) long, glabrous, more or less deeply cleft at apex; pinnae broadly deltoid, obtuse; at least the basal secondary segments cuneate at base from nearly orbicular to deltoid-lanceolate, obtuse; outer segments often linear-oblong with nearly parallel sides.

“*C. tenuis* - Indusium about 1/50 inch (0.5 mm) long shallowly lobed or nearly entire; blade often only pinnate-pinnatifid, the basal secondary segments cuneate at base, oblong to obovate, only shallowly toothed or lobed and with broad, rounded apex, if more deeply lobed often lanceolate or oblong-lanceolate.”

After you read and reread this you may be glad that in the text on page 313, Mr. Shaver says, “In any case, *C. tenuis* is difficult to identify, but it is hoped that the drawings (Fig. 163) will help with recognition.”

Boughton Cobb in A Field Guide to the Ferns, 1956, writes: “*C. tenuis* - a variety with very small indusia and subleaflets only slightly toothed.

Edgar T. Wherry in The Fern Guide, 1961, writes regarding *C. tenuis*: “This differs in having the lower pinnules of major pinnae narrower and taper-based, and especially in the indusia being nearly circular and truncate at the tip.”

John Mickel in his excellent field guide How to Know the Ferns and Fern Allies, 1979, makes reference only to *C. fragilis*.

Mickel in Ferns for American Gardens, 1994, not really a source intended for field identification, writes: The pinnae (of *C. tenuis*) are at times held upward at an angle toward the blade apex and *C. tenuis* is usually larger than *C. fragilis* but is often difficult to distinguish from it.”

David B. Lellinger’s A Field Manual of the Ferns and Fern Allies, 1985: I will try to interpret the significant differences that he notes on pages 256-261 (the book is readily available):

C. fragilis: fronds grow very closely together as compared to *C. tenuis* (“congested” vs. “approximate”)

C. fragilis: lowest pair of pinnae are spaced farther from the next pair above them compared to *C. tenuis*, (“rather distantly” vs. “slightly distant”)

C. fragilis: basal pinnules sessile, truncate to obtuse at the base - indusia lanceolate.

C. tenuis: basal pinnules cuneate in less divided forms, obtuse in more divided ones; indusia ovate often lacerate at the apex. Pinnules with a broad uncut center; segments mostly round at the apex.

From Flora of North America, Vol, 2, 1993; *Cystopteris* authors: C. Haufler, R. Moran, M. Windham; key page 265

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It's a Cystopteris Continued from pg. 25

“*C. tenuis*: pinnae typically at acute angle to rachis, often curving toward blade apex; pinnae along distal 1/3 of blades ovate to narrowly elliptic; margins of pinnae usually crenulate or with rounded teeth; basal basiscopic pinnules of proximal pinnae cuneate to rounded at base.

“*C. fragilis*: pinnae perpendicular to rachis; not curving toward blade apex; pinnae along distal 1/3 of blade deltate to ovate; margins of pinnae with sharp teeth; basal basiscopic pinnules of proximal pinnae truncate to rounded at base.”

For those finding the last sentence of each paragraph above intimidating, here are the definitions from the glossary of the previously listed book by Lellinger:

basiscopic: facing the base of the axis on which it is borne.

proximel: toward the base in position

basal: of or pertaining to the base

base: the proximal portion of a structure, that point nearest the point of attachment.

A rough translation is: the base of the first pinnule on the lower side of the lowest pinna is wedge-shaped to rounded on *C. tenuis* and square to rounded on *C. fragilis*.

And further from Flora of North America, page 269: “In the center of its distribution (Minn., Iowa, Ill., Wisc., Ind., Ohio, Penna.) the narrow elliptic pinnae angled toward the blade apex and the rounded teeth make *C. tenuis* relatively distinct from *C. fragilis* and *C. protrusa* (although the early season sterile leaves of *C. protrusa* often resemble those of *C. tenuis*). In the west and ESPECIALLY IN THE NORTHEAST, *C. TENUIS* AND *C. FRAGILIS* ARE DIFFICULT TO DISTINGUISH (emphasis mine). For the most part, *C. fragilis* is confined to higher latitudes and elevations than *C. tenuis*, but the two species can be sympatric and occasionally form sterile tetraploid hybrids.” On page 270 - “*C. fragilis* is more likely to be found on cliffs whereas the other species prefer boulders and soils.”

From The Ferns and Allied Plants of New England, Tryon and Moran, 1997: “ var. *fragilis*: pinnules triangular, widest at the base, indusia relatively large, up to 1 mm. long, more or less cleft at the apex.

“var. *mackayi* (*C. tenuis*) in Flora of North America above: pinnules typically obovate to elliptic with a wedge-shaped base; indusia about 0.5 mm. long and shallowly lobed or nearly entire.

“Varieties are used here rather than species because the plants intergrade.” Sounds like where we began 98 years ago.

To minimize confusion regarding references to the indusium I offer my understanding for what it's worth. The indusium looks like a miniature cup lying on its side. Think of the difference in length between species as directly related to the shape of the rim of the cup. An entire, truncate, ovate, circular or cup-shaped rim translates into a short indusium. Add a long tail to the rim (lanceolate, pointed, elongated, cleft) and it naturally translates into a longer indusium. After all this, the indusium is only visible for a short time - one week? two weeks? Also, do not confuse the shape of the sorus with the indusium shape.

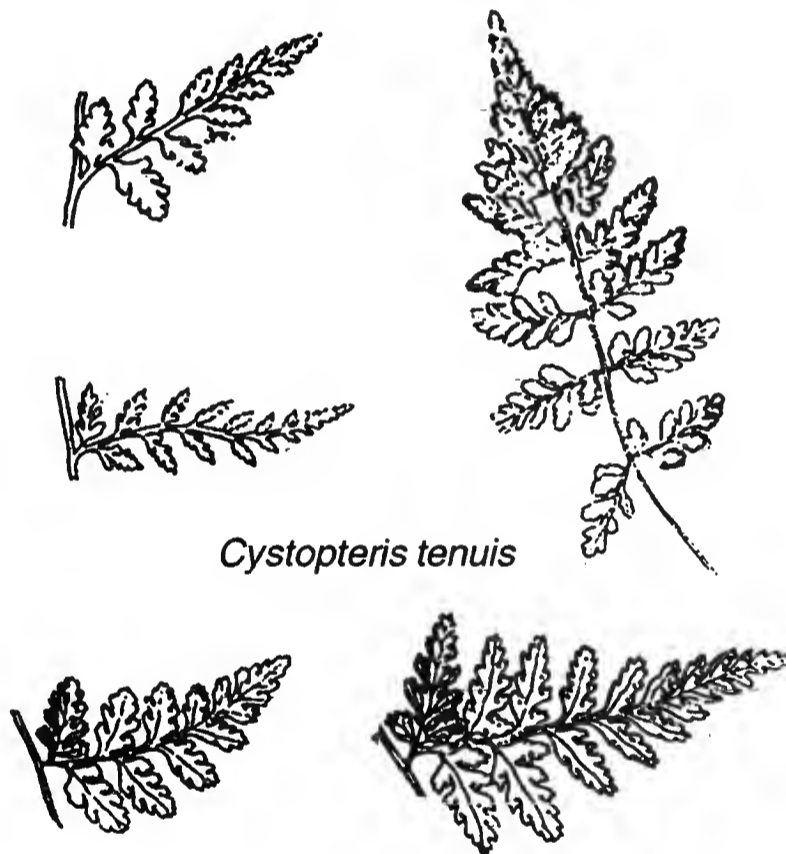
The digested consensus of most of the authors quoted in this article are:

shape of pinnules and teeth tend toward
rounded in *C. tenuis*
pointed in *C. fragilis*

Base of the 1st pinnule on the lower side of the lowest pinna is
wedge-shaped to rounded on *C. tenuis*
square to rounded on *C. fragilis*

Indusium (when visible) tends toward
short and entire on *C. tenuis*
long and lanceolate on *C. fragilis*

On future field trips we will look for these characteristics as a starting point to field identification. If we can't make the identification with confidence, we'll just quote from Flora of North America, "*C. tenuis* and *C. fragilis* are difficult to distinguish."



Cystopteris tenuis

Cystopteris fragilis var *protrusa*

Ralph Wilen passed away unexpectedly in August 2000. He was devoted to his fern and native plant studies and a strict conservationist dedicated to the preservation of native ferns and wildflowers. He was an active member and leader of the Delaware Valley Fern and Wildflower Society. Not surprisingly he was also a bird lover and an avid supporter of the preservation of their wildlife habitats.

We are grateful for his contribution, thank member Jack Schieber for making it available and extend our sincere sympathy to his widow Ellen.

List of State Fern Floras ©2001

Prepared by
John D. Scott
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Berks Co., Pennsylvania
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The list presented here began as a project to find and collect the county dot map data for the pteridophytes of the United States. It was hoped that there would be sufficient published maps to create a composite atlas of US pteridophytes. This was not the case. Only a few states have recent floras, general or fern, with dot maps. Most published data is approaching 50 years old. For some states a flora with maps has never been published.

Over a period of six months in 2000 I actively sought to buy as many floras as I could to have a complete library in hand. Search services on the Internet were very helpful in finding books. Correspondences via FERNET were extremely helpful in locating some of the reprints. In the list below a * indicates the references that I have not seen. A ** indicates online atlases and their web addresses. As of December of 2000, all of the WEB addresses worked.

THE *Flora of North America* IS ONLINE!

FNA presents for the first time, in one published reference source, information on the names, taxonomic relationships, continent-wide distributions, and morphological characteristics of all plants native and naturalized found in North America north of Mexico. The Flora will appear in 30 volumes and will be available in print and on the Web. The pteridophytes are published in volume 2. <http://hua.huh.harvard.edu/FNA/>

ENGLANDER, CLAIRE & PHILIP HOEHN. *Checklist of Online Vegetation and Plant Distribution Maps*. <http://www.lib.berkeley.edu/EART/vegmaps3.html> - united. This site lists online state and regional dot maps.

ANGELO, RAY & DAVID E. BOUFFORD *Atlas of the flora of New England: Pteridophytes and Gymnosperms*. <http://www.herbaria.harvard.edu/~rangel/Neatlas0/Intro-Pterid&Gym.html> This is the only regional guide and includes data not available for the individual states.

State fern floras:

Alabama (AL)

DEAN, BLANCHE E. (1969) *Ferns of Alabama*. xxiv, 222 pp. illus. (rev. ed.). Southern Univ. Press.

*DEAN, BLANCHE E. (1964) *Ferns of Alabama*. Southern Univ. Press.

Alaska (AK)

WELSH, STANLEY L. (1974) *Pteridophytes*. pp. 1-29 <in> *Anderson's Flora of Alaska and adjacent parts of Canada*. Brigham Young Univ. Press. Provo.

TAYLOR, THOMAS M. C. (1970) *Pacific northwest ferns and their allies*. 247 pp. illus. Univ. Toronto Press. Toronto & Buffalo.

HULTÉN, ERIC (1968) *Pteridophytes*. pp. 24-58 <in> *Flora of Alaska and neighboring territories. A manual of the vascular plants*. Stanford Univ. Press.

Stanford, California.

ANDERSON, J. P. (1959, repr. 1961) *Flora of Alaska and adjacent parts of Canada*.

*ANDERSON, J. P. (1943) *Flora of Alaska and adjacent parts of Canada*. Part I. *Iowa State Coll. J. Sci.* 18:137-175.]

TRELEASE, WILLIAM (1910) *The ferns and fern allies of Alaska*. Pp. 375-398 <in> *Cryptogamic Botany* by J. Cardot, et. al. Harriman Alaska Ser. Vol. 5.

Smithsonian Inst. Publ. 1994.

Arizona (AZ)

*LEHR, J. HARRY (1978) *A catalogue of the flora of Arizona*. vi, 203 pp. Desert Botanical Garden, Phoenix, Ariz.

*KEARNEY, THOMAS H. & ROBERT H. PEEBLES (1960) *Arizona flora*, 2d ed. Berkeley, University of California Press, viii, 1085 p. illus., map. 25 cm.

MORTON, C. V. (1951) *Ferns and fern allies*. pp. 27-49. <in> *Arizona Flora* by Thomas H. Kearney and Robert H. Peebles. Univ. Calif. Press. Berkeley.

PHILLIPS, WALTER S. (1946-47) A check-list of the ferns of Arizona. *Amer. Fern J.* 36:97-108. 37: 13-20, 39-51.

*KITTELL, SISTER TERESITA (1941) *Ferns and fern allies of Arizona and New Mexico* <in> Tidestrom and Kittell, *A Flora of Arizona and New Mexico*. Catholic Univ. Press.

Arkansas (AR)

*SMITH, EDWIN B. (1994) *Keys to the flora of Arkansas*. xii, 363 pp. University of Arkansas Press, Fayetteville.

**SMITH, EDWIN B. (1988) *An Atlas and Annotated Checklist of the Vascular Plants of Arkansas*. University of Arkansas Herbarium, Biota of North America Program, Texas A&M University, Bioinformatics Working Group. <http://www.csd.tamu.edu/FLORA/arkansas/arkfamxx.htm>

TAYLOR, W. CARL (1984) *Arkansas ferns and fern allies*. 262 pp., illus., dot maps. Milwaukee Public Museum, Milwaukee, Wisconsin.

MOORE, D. M. (1940) *Arkansas Pteridophyta*. *Amer. Fern J.* 30: 105-119.

California (CA)

**THE JEPSON HERBARIUM UNIVERSITY OF CALIFORNIA AT BERKELEY *The vascular plants of California. Checklist and distribution maps of taxa covered by THE JEPSON MANUAL OF CALIFORNIA VASCULAR PLANTS.*

<http://ucjeps.herb.berkeley.edu/jeps-list.html>

KIEFER, LAWRENCE L. & BARBARA JOE (HOSHISAKI). (1967) *Check list of California Pteridophytes*. *Madroño* 19(3): 65-73.

JEPSON, WILLIS LINN (1966) *Pteridophytes*. pp. 21-44 <in> *A manual of the flowering plants of California*. Univ. California Press. Berkeley.

GRILLOS, STEVE J. (1966) *Ferns and fern allies of California*. (Calif. Nat. Hist. Guides: 16) 104 pp. illus. Univ. Calif. Press. Berkeley.

MUNZ, PHILIP A. & DAVID D. KECK (1963) *Pteridophytes*. pp. 21-47 <in> *A California flora*. Univ. Calif. Press. Berkeley.

Colorado (CO)

HARRINGTON, H. D. & L. W. DURRELL (1950) *Colorado ferns and fern allies, Pteridophyta*. 96 pp. illus. Colo. Agric. Res. Found. Fort Collins.

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List of State Fern Floras Continued from pg. 29

Connecticut (CT)

*MAGEE, DENNIS W. & HARRY E. AHLES (1999) *Flora of the Northeast*. xxxi, 1213 p. : ill., maps. University of Massachusetts Press, Amherst.

TRYON, ALICE F. & ROBBIN C. MORAN (1997) *The Ferns and Allied Plants of New England*. xv, 325 pp. Center for Biological Conservation, Massachusetts Audubon Society, Lincoln, MA .

HARGER, EDGAR BURTON & C. A. WEATHERBY ET. AL. (1930) *Pteridophytes*. pp. 9-14 <in> Additions to the flora of Connecticut {First supplement to Bull. No. 14.}. State Geol. and Nat. Hist. Surv. Bull. No. 48. Hartford.

GRAVES, CHARLES BURR (1910) *Pteridophytes*. pp. 2-33 <in> *Catalogue of the flowering plants and ferns of Connecticut growing without cultivation*. State Geol. and Nat. Hist. Surv. Bull. No. 14.

District of Columbia (DC)

BLAKE, S. F. (1957) *Ferns and Fern-allies of the District of Columbia*. Amer. Fern J. 47: 149-155.

REED, CLYDE F. (1953) *The ferns and fern allies of Maryland and Delaware including the District of Columbia*. xvii, 286 pp. 72 pl. 58 maps. Reed Herbarium. Baltimore.

Delaware (DE)

REED, CLYDE F. (1953) *The ferns and fern allies of Maryland and Delaware including the District of Columbia*. xvii, 286 pp. 72 pl. 58 maps. Reed Herbarium. Baltimore.

Florida (FL)

**WUNDERLIN, R. P. & B. F. HANSEN (2000) *Atlas of Florida Vascular Plants*. [S. M. Landry and K. N. Campbell (application development), Florida Center for Community Design and Research.] Institute for Systematic Botany, University of South Florida, Tampa <http://www.plantatlas.usf.edu/>

NELSON, GIL (2000) *The ferns of Florida*. 208 pp. Pineapple Press, Inc. Sarasota, FL

*WUNDERLIN, RICHARD P. & BRUCE F. HANSEN (2000) *Flora of Florida*. University Press of Florida, Gainesville

*LAKELA, OLGA & ROBERT W. LONG (1977, ed. 2) *Ferns of Florida, an illustrated manual and identification guide*. ix, 178 pp. Banyan Books. Miami, Florida.

LAKELA, OLGA & ROBERT W. LONG (1976, ed. 1) *Ferns of Florida, an illustrated manual and identification guide*. ix, 178 p. Banyan Books. Miami, Florida.

CORRELL, D. S. (1938) *County check-list of Florida ferns*. Amer. Fern J. 28: 11-16, 46-54, 91-100.

SMALL, JOHN KUNKEL (1931) *Ferns of Florida*.....viii. 237 pp. illus. The Science Press. New York.

Georgia (GA)

*JONES, SAMUEL B., JR. & NANCY CRAFT COILE (1988) *The distribution of the vascular flora of Georgia*. 1 atlas (230 p.) : maps. Dept. of Botany, University of Georgia, Athens.

SNYDER, L. H. JR. & J. G. BRUCE (1986) *Field guide to the ferns and other Pteridophytes of Georgia*. 270 pp. Univ. Georgia Press. Athens.

DUNCAN, W. H. & J. T. KARTESZ (1981) *The Vascular Flora of Georgia; An Annotated Checklist*. University of Georgia Press, Athens, GA.

BRUCE, J. G. & S. B. JONES, JR. AND N. C. COILE (1980) *The Pteridophytes of Georgia*. *Castanea* 45:185-193.

MCVAUGH, ROGERS (1951) *Ferns of Georgia*. xviii, 195 pp. illus. maps. Repr. 1968. Univ. Ga. Press. Athens.

Hawaii (HI)

VALIER, K. (1995) *Ferns of Hawai'i*. Viii, 88 pp. University of Hawai'i Press. Honolulu, HI.

Idaho (ID)

FLOWERS, SEVILLE (1950) *A List of the Ferns of Idaho*. *Amer. Fern J.* 40: 121-131.

Illinois (IL)

MOHLENBROCK, ROBERT H. (1999) *The illustrated flora of Illinois — Ferns*. xv, 240 pp. illus. maps. Southern Ill. Univ. Press. Carbondale.

MOHLENBROCK, ROBERT H. (1967) *The illustrated flora of Illinois — Ferns*. xv, 191 pp. illus. maps. Southern Ill. Univ. Press. Carbondale.

JONES, GEORGE NEVILLE (1947) *An enumeration of Illinois Pteridophyta*. *Amer. Midl. Nat.* 38: 76-126.]

Indiana (IN)

DEAM, CHARLES C. (1940) *The ferns and fern allies of Indiana. (repr. from the Flora of Indiana) pp. 37-69 Div. of Lands and Waters. Dept. Conserv.*

Iowa (IA)

PECK, J. H. (1976) *The pteridophyte flora of Iowa*. *Proc. Iowa Acad. Sci.* 83:143-160.

COOPERRIDER, TOM S. (1960) *The Lycopodiaceae and Selaginellaceae of Iowa*. *Amer. Fern J.* 50: 267-169.

COOPERRIDER, TOM S. (1958) *The ferns and other pteridophytes of Iowa*. (St. U. I. Stud. Nat. Hist. 10(1)). 66 pp. 82 fig. 53 maps. State Univ. Iowa. Iowa City.

LYNESS, A. S. (1937-38) *Key to the ferns of Iowa*. *Amer. Fern J.* 27: 132-135, 28: 16-25.

MELHUS, I. E. (1936) *Native ferns of Iowa*. (Extension Cir. 225) 52 pp. illus. Iowa State College. Ames.

Kansas (KS)

PETRIK-OTT, ALETA JO (1979) *The Pteridophytes of Kansas, Nebraska, South Dakota and North Dakota, U.S.A.* *Beih. Nova Hedw.* 61: 1-332.

MCGREGOR, RONALD L. (1960) *Ferns and allies in Kansas*. *Amer. Fern J.* 50: 62-66.

HUMFELD, P. H. (1951) *A checklist of Kansas Pteridophytes*. *Amer. Fern J.* 41:53-60, 79-85.

Kentucky (KY)

CRANFILL, R. (1980) *Ferns and fern allies of Kentucky*. Kentucky Nature Preserves Commission Sci. & Tech. Series No. 1:1-282.]

WHARTON, MARY E. & ROGER W. BARBOUR (1971 - Reprinted with corrections in 1979). Pp. 23-45 *in* *A Guide to the Wildflowers & Ferns of Kentucky*, The University of Kentucky Press.

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MCCOY, THOS. N. (1938) *Ferns and fern-allies of Kentucky*. Amer. Fern J. 28: 41-46, 101-110.

WILLIAMSON, JOHN (1878) *Ferns of Kentucky*.....154 pp., 60 pl. John P. Morton & Co. Louisville.

Louisiana (LA)

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Dryopteris filix-mas – A Fern Find in Pennsylvania

Joan Eiger Gottlieb – Pittsburgh, PA



D. filix-mas scanned frond tip showing double rows of sori along pinnule veins

“It can’t be male fern,” I said with disbelief. “It doesn’t grow here.” Indeed, *Dryopteris filix-mas* has not been recorded previously in Pennsylvania. In eastern North America it is a rare fern of calcareous woods around the Great Lakes, Nova Scotia and Newfoundland. I have seen it growing out of deep crevices in thick limestone beds on the Bruce Peninsula of Ontario, which juts into Lake Huron. But, even the closest of these places is over 200 miles (333 km) north west of the site near Pittsburgh where, on November 12, 2000, I was unexpectedly face to frond with 19 mature, fertile plants!

This newly found, disjunct population is in a preserve called Dead Man’s Hollow. The 400 acres (160 hectares) here were acquired in several pieces starting in 1996 by the Allegheny Land Trust, using state, county and private funds. It lies about 12 miles (19 km)

south east of downtown Pittsburgh near the city of McKeesport. The history of the Hollow is as fascinating as the finding of a rare fern there. The morbid name dates to the 1870’s when a group of boys reportedly found a man’s body hanging from a tree in the “holler.” News clips from the era recount subsequent murders, industrial accidents, explosions, and drownings, all contributing to a lingering legend of fatality. Today, Dead Man’s Hollow is a pleasant, quiet spot, largely untouched for the past 50 years. Prior to that it was quarried, logged, farmed, and for the first half of the 20th century it housed a clay sewer pipe factory. A few walls and kiln sites remain and pipe shards are very evident along the entry “archaeology” trail. However, no roads or utility lines ever penetrated the Hollow, so one sees only verdant bottom land, laced with small streams and surrounded by steep slopes. The secondary forest now maturing has mixed eastern deciduous trees, young, introduced white pine and hemlock, and a somewhat weedy undergrowth of native and exotic species. The preserve is bordered by residential neighborhoods and an abandoned rail line that is being converted to a biking/hiking trail along the Youghiogeny River.

The area where the male fern grows is in the hilly northeast section of the preserve on a 125’ (38m) span of 15’ (4.5m) high limestone talus. It lies well above the earlier disturbed lowland and is accessible by a narrow foot trail. Most of the plants are fully mature with fronds measuring an average of 26” (66cm). I have grown *D. filix-mas* from young sporelings in my garden and estimate the biggest plants in the Hollow

population to be at least 15-20 years old. Nearly all have abundant sori. Some of the specimens have large, double crowns and are obviously thriving at this unexpected site.

The rest of the fern flora in the preserve is unremarkable, consisting of common western Pennsylvania species like *Dryopteris intermedia* and *D. carthusiana* in abundance, along with occasional plants of *D. marginalis* and *Polystichum acrostichoides*. A bit unusual is a large population of ebony spleenwort (*Asplenium platyneuron*). Some plants grow on the crumbling walls of the old pipe factory and the species is common on the limestone and shale cliffs along the bike trail/rail line leading to the preserve. But, in the area where the *D. filix-mas* is found, the spleenworts are particularly numerous and robust, with thick clusters of erect, fertile fronds over 12" (30cm) tall. They look like spleenworts on steroids!

Male fern is easily recognizable (see illustration) by its long, slender, stiffly-upright, persistent fronds with short stipes cloaked in light brown scales, blunt-tipped pinules, and double rows of sori close to the midveins and mostly on the distal (tip) half of fertile fronds. The populations of male fern found in neutral to alkaline (limestone) sites in northeast and northwest North America are tetraploids (4) of unclear origin. They appear to be different morphologically and ecologically from those growing on acidic granite and igneous rock in the southwest Rocky Mountains. In *Flora of North*



Talus habitat photo of *D. filix-mas* and frond measurement by author. Dead Man's Hollow, PA
Photo by Milton Gottlieb.

America (1) it is noted that the southern Rocky Mountain taxon may be related to (or the same as) the apogamous triploid *D. pseudofilix-mas* from Mexico. *D. filix-mas* is common in a wide variety of habitats in Europe and parts of Asia, and most male fern available through nurseries in the United States is from European sources. Rickard (2) lists 15 cultivars in the trade. According to Hoshizaki (3) the European taxon is an allopolyploid (4) of *D. caucasica* X *D. oreades*. There is clearly room for additional work on the systematics of the "male fern" complex.

Returning to my original amazement at seeing *D. filix-mas* in western Pennsylvania, (5) a logical question is, "How did it get here?" Disjunct populations of many ferns are known. The forked spleenwort *Asplenium septentrionale* is primarily a west-

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***Dryopteris filix-mas* Continued from pg. 39**

ern species in North America. However, isolated populations are documented more than half a continent away in two West Virginia counties. American hart's-tongue fern (*Asplenium* [*Plyllitis*] *scolopendrium*), a calciphile of the Niagara escarpment in New York, Michigan, and Ontario, has distant outposts in Alabama and Tennessee. Since both these ferns, as well as American male fern, are related to forms found in Europe and Asia, it seems possible that they once had a more widespread, even circumglobal distribution. For many taxa, continental movements, climate, habitat alteration/destruction, and other factors have resulted in periods of isolation long enough for the evolution of divergent genomes, morphologies, and adaptation to new habitats. The male fern in Dead Man's Hollow may be a relict population surviving in the microclimate of the Hollow (where the Canadian hemlock planted here is also thriving, although it occurs naturally this far south only in isolated, cool ravines.)

On the other hand, dust-sized fern spores can, and do, travel on prevailing winds. Occasionally they may produce gametophytes and eventually sporophytes in favorable, distant sites creating disjunct populations. Who knows what spores come down to Pennsylvania on those "lake-effect" storms that frequently dominate our weather system? Or, the ferns in Dead Man's Hollow may have started from spores more locally produced on cultivated specimens in the surrounding area. From their presence on limestone talus and their strong resemblance to American male fern I tend to exclude a garden origin. As was mentioned earlier, most nursery material is European in origin and possibly of different lineage. I have recognizably distinct American male fern (from Ontario spores) and British male fern (purchased plants) in my garden.

However they got there, the male ferns at Dead Man's Hollow were a joy to find. So, put aside your preconceived notions of what should and should not grow in a given place. When out hiking, keep an open mind and a sharp eye on those rock outcrops.

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- (2) Rickard, Martin, *The Plantfinders Guide to Garden Ferns*, Portland OR, Timber Press, 2000.
- (3) Hoshizaki, Barbara Joe and Kenneth A. Wilson, "The Cultivated Species of the Fern Genus *Dryopteris* in the United States," *Amer. Fern Journal* 89(1), Jan. - Mar., 1999.
- (4) Tetraploid – having 4 sets of hereditary material packaged within chromosomes. Each set contains the chemical code for all the proteins that characterize an organism structurally (through membrane architecture) and functionally (through enzyme catalysts). Egg and sperm cells (gametes) are haploid, represented as "n" - the irreducible number of chromosomes needed to contain one complete set of genes for the species. Fertilized eggs (zygotes) are, therefore, usually diploid (2n,) receiving a complete, but often varied set of genes from each parental gamete. Tetraploids (4n) can be created initially from mutations that lead to spontaneous doubling of the chromosomes in diploid (2n) zygotes. The resultant 4n sporophytes are usually fertile because their even numbers of matched (homologous) chromosomes can pair up properly as they must in the special divisions that produce viable spores. These spores are each 2n, as are the gametophytes and gametes that grow from them. Fertilization then restores the 4n sporophyte generation of what is often a new, stable species.

- a) polyploid – the general term that applies to any multiple chromosome sets above diploid, e.g. triploid (3n,) tetraploid (4n,) pentaploid (5n,) and hexaploid (6n,) all known to occur in ferns. Beyond 6n the instability of “chromosome overload” appears to lessen survival.
 - b) autopolyploid – more than 2 sets of chromosomes, the sets being alike and derived from a single ancestral species.
 - c) allopolyploid – more than 2 sets of chromosomes, more or less dissimilar and derived from 2 or more different ancestral species (fairly common in fern genera containing related species that hybridize.)
- (5) A voucher frond (Sheet No. 498068) is on file at the herbarium of the Carnegie Museum (CM), 4400 Forbes Avenue, Pittsburgh, PA 15213. A short article “*Dryopteris filix-mas* New in Pennsylvania” has been sent to the American Fern Journal.

What's in a Name - *Dryopteris filix-mas* - the “Male Fern”

Sue Olsen - Bellevue, WA

Fern enthusiasts with e-mail capabilities can participate in “fernet” which is an e-mail list group posting comments, questions and observations about ferns. A number of HFF members subscribe and contribute periodically. (To subscribe send an e-mail to macjordomo@koning.ecsu.ctstateu.edu and send the command “Subscribe Fernet” followed by your first name and last name.) Participation tends to become particularly active with the mention of Platyceriums, tree ferns and tropicals but periodically something of interest to the hardy fern enthusiast sparks a discussion. Late in the fall of 2000 John Steel of New Zealand asked for information about the origin of the common name “male fern” for *Dryopteris filix-mas*. It perked my interest (especially since I had just received a manuscript about a new site for the male fern - *Dryopteris filix-mas* - in western PA - see page 38). The common name for this common fern goes back - way back - to the Greeks at least and it is generally accepted that male fern is so named because it is a robust species while the lady fern, *Athyrium filix-femina*, (which also figures in the historical discussion along with bracken *Pteridium aquilinum*....hang in there for all of this) is more delicate and lacy – consequently feminine. Some other suggestions were that the male fern is named for:

1. Its greater fecundity when compared to others.
2. Being stronger medicinally than others.
3. Being physically more robust than most others.

The robust suggestion is the most common explanation.

Meanwhile, in pursuit of more information I took a botanical romp through herbal history. Not surprisingly, as an extremely common fern it acquired quite a following from the herbal medicine historians. In addition there are many somewhat magical attributes that have been ascribed to it in fern lore over the centuries. I'm presenting some of the more interesting followed by a contribution from Wim de Winter of the

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Netherlands that goes well back in history and will test our knowledge of early English!

Medicinal uses:

As *Lastrea filix-mas*, "The rhizome of this species has been employed as an anthelmintic ever since the time of Theophrastus, and it is still a favourite remedy in worm cases in many parts of the Continent. The attention of modern medical practitioners was probably first directed to it in consequence of its being the ostensible remedy of Madame Nouffer of Switzerland who sold her secret method of expelling the tape-worm to Louis XVI for 18,000 francs." Johnson and Sowerby.

Abbe in *The Fern Herbal*, 1981 notes that the name goes back to the early Greek and Roman days where in Latin it was *filix-mascula*. He also writes, "*D. filix-mas* is the only fern ever included in the United States Pharmacopoeia. Long known in Europe and Asia, the herb is currently sold in apothecary shops of modern China, India and other countries. The principle extracted from the rootstock is a thick dark green liquid called Oleoresin of Male Fern. It is poisonous if not taken in carefully regulated doses. Forms used are powder, fluid extract or extract by ether, the latter being the most effective, containing at least a fourth of crude filicin. In Gerard's time the bruised rhizome was 'drunke in Mede or honied water and more effectually if it be given with two scruples or two third parts of a dram of Scamoni (Syrian bindweed) or of blacke Hellebor: they that will use it....must first eat Garlicke'. Gerald was not taking chances. Garlic, scammony and hellebore are all strong anthelmintics."

Similar reports from Chris Page, "Infusions of Male Fern (*Dryopteris filix-mas*), Lady Fern *Athyrium filix-femina*), Hard Fern (*Blechnum spicant*), Rusty-back Fern (*Ceterach officinarum*) and various other unspecified ferns, were held to bring relief from a wide manner of ills, including inflammatory, asthmatic, rheumatic, urinary, pulmonary, bronchial and other disorders....Of especially popular use appears to have been the ability of Common Male Fern (*Dryopteris filix-mas*) to yield rhizome extracts which were held to be effective as vermifuges in the treatment of tapeworm. Such a use of these ferns is probably extremely ancient, for the use of an oil extract of fern to expel worms appears to go back to at least 300 BC, when it was recommended by the Greek botanist and physician Theophrastus.

The successful application of some of these treatments were probably acts of faith, and their efficacy must, of course, be treated with some scepticism today. However, this does not imply that they should necessarily all be dismissed out-of-hand. Many were accepted by long and popular usage over centuries. Although many ferns wait to be more fully analysed and investigated by modern science, we already know that ferns contain mucilages and an enormous range of secondary plant chemical compounds, many of which are unique to pteridophytes. The strong anthelmintic properties of the rhizomes of nearly all species of *Dryopteris* for example, although their medicinal use is regarded as obsolete and dangerous today, are attributable to the presence of acylphloroglucinol components, of which as many as fifty variants have been analysed from a range of species of this genus, with several occurring simultaneously in some plants."

Other information from Chris indicates that the old English name for the male fern was Mekkin "...whilst *Marc raineach* ('Horse Fern') is Common Male Fern (*Dryopteris filix-mas*) in Scots and Irish Gaelic..." and one of my favorites, "The rhizome of Male Fern (*Dryopteris filix-mas*) applied gently to the sleeping eyelids was supposed to be a love-philtre, that the wearer might fall in love with the first person who he or she thereafter sees."

Referring to Ward, the inventor of the Wardian case, "Early in 1830 he chanced to notice that in a large bottle loosely covered with a lid in which he had shut up a hawk-moth chrysalis the previous summer (for he also dabbled in entomology, in the then customary amateurish way) some seedlings had sprung up in a little moist mould. These proved to be a grass, *Poa annua*, and a fern, *Dryopteris filix-mas*. The bottle was transferred to a ledge outside his window and contrary to his expectation the plants continued to thrive in it without any fresh water for ultimately at least nineteen years." Ward "on the growth of plants in closely-glazed cases" as quoted in *The Victorian Fern Craze* by David Allen.

"Among its other names are knotty brake fern, sweet brake and vermifuge, the latter referring to its anthelmintic properties. The stem and roots are bitter and astringent and have been used in lieu of hops in brewing. Its ashes have also been used in glass making. The curious 'St. John's hands' once sold to the credulous as charms against magic and witchcraft were made from the rootstock and expanded fronds of this species. The rootstock yields the Filix-mas of the pharmacist." Clute.

And finally two opinions –

As *Nephrodium filix-mas* "...considered one of the very best...as it bears smoke better than any other British Fern." Schneider 1905.

As *Lastrea filix-mas*, "It is one of those few species which are seen in thousands of suburban gardens, monopolizing space which would certainly be better devoted to varietal forms of this and other hardy species." Druery 1910.

I wonder whether they were friends!

Additional information or comments would be most welcome. The easiest way to reach me is by e-mail at Foliageg@juno.com or drop a line at 2003 128th Ave. S.E., Bellevue, WA 98005.

References

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Wim de Winter

Wageningen, The Netherlands

A few weeks ago we had something to do about the origine of the names Male fern and its female counterpart. I finally found a copy of Dodonaeus's Herbal (before 1557) to see what he really says about it. Here it is:

"There be two kindes of Fernes (as Diofcorides writeth) the male and female, the which in leaues are very well like one another."

So he refers for it, as was quite customary in his times, to Dioskorides, a 1st century Roman herbalist of Greek origin. As I remember well, Dioskorides was not a very original author, so we may well assume the names pair is still older than that. At least "if" it was in the original manuscripts, for in mediaeval times D.'s books have been copied and adapted. That the male fern is *Dryopteris filix-mas* needs not be doubted about:

"The male Ferne hath great long leaues; fometimes of two foote in length, fspread abroad upon each fide like wings cut in euen to the middle ribbe or finew, and fnipt and toothed round about like a saw : under which leaues yee may fee many little fpts or marks, the which in continuance of time become black, and after they fall off : the roote is thicke, and blacke without, putting forth manie leaues, and small dodkins or fprings, which are the beginning of leaues. This kind of Ferne beareth neyther Floures nor Seede, except wee fhall take for feede the blacke fpts growing on the backfide of the leaues, the which fome do gather thinking to work wonders, but to fay the truth, it is nothing elfe but trumperie and fuperftition. Male Ferne groweth almoft in all rough and un-euen places, in moift fandie grounds, and alongft the borders of fields, ftanding lower invalleyes."

This description is in itself not very exact, but the illustration (not included in this english translation) is a *D. filix-mas*. Moreover, it is a common fern in the region where this book was written, viz. the west of Holland. More of a problem is the nature of its wife: "The female Ferne alfo, hath neyther Floures nor Seede, but hath long, greene, bare ftemmes, uppon the which grow many leaues on euerie fide, cut in, and toothed round about, verie like to the leaues of make Ferne, but but fomewhat leffe : the roote of this Ferne is long and fmall, blacke without, and creeping along in the ground. The female kind is found in woods and mountains. (...) is called (...): in Englifh Brake, Common Ferne, & female Ferne."

The clearest character is the creeping rhizome. Further, in the author's interpretation the leaves do not arise from the rhizome directly, as in the male fern, but are borne on long, bare (naked) green stems. So each pinna is taken for a leaf, and much like one of the male fern, but somewhat smaller. No doubt that this is a description of Bracken rather than Lady Fern. Again, the illustration removes any remaining doubt. Surprisingly he doesn't mention the linear sori (instead of the little dots).

So when did the Athyrium usurp this name? At least from Linnaeus onward the names have been used in the present way. Interesting, however, is that L. gives *Filix femina* as a synonym for *Pteris aquilina*, referring to Fuchs. In Fuch's 'De historia stirpium' (1549) we read:

"De Pteride Cap. CCXXVII Duo Filicis sunt genera, mas fcilicet & foemina. Mas Graecis simpliciter pteris, Latinis Filix mas (...) dicitur foemina Graecis thelypteris, Latinis Filix foemina" (There are two kinds of ferns, viz. male and female. The male is called in Greek simply Pteris, in Latin Filix mas (...) The female is called in Greek Thelypteris, in Latin Filix foemina) Then the descriptions follow which are essentially the same as the ones in Dodonaeus, likewise the pictures. The Greek names are exactly the same as the ones cited in Dodonaeus, and there are more similarities in the texts. I assume they are based on the same source, possibly one of each other. Fuchs cites classical authors: Dioscorides, Plinius, Galenus, Theophrastus. Possibly the source of Thelypteris/Female Fern can be found somewhere here. Somewhere in history Athyrium and Pteridium must have been confused. I have not yet seen 16th century herbals, but if I judge Linnaeus right there must be some. This could be Fuch's interpretation of the classical literature, or maybe the confusion has been of all times. Misinterpretation of the two herbals cited here is not very likely as compared to later floras the descriptions are quite good and the illustrations hardly leave room for applying them to Athyrium. Finally: Access to these rare old books is possible thanks to the French national library (<http://gallica.bnf.fr/> - click on catalogue). They have scanned in many old books now free of copyrights, which you can see as. TIFF or pdf-document. The whole books can be downloaded and I've made a nice cd-rom full of antique pteridological works. Beware, their server is rather slow and the documents can be extremely large!

CORRECTION - Frond Emergence Study

In the winter 2001 issue, Ralph Archer presented his proposal to collect and publish data on the dates of emergence of fern fronds throughout temperate climates. His P. O. Box was listed incorrectly by one digit. Please note that Ralph's correct address is:

Ralph Archer
P. O. Box 43036
Louisville, KY 40253

To date twelve members have offered to assist with the research. Thank you!! The representation is nicely distributed throughout the temperate US and Canadian climate zones, however, we really need a contributor(s) from the Atlanta/Birmingham/SE-US corridor, the Rocky Mountains and the greater Bay area in California. (Overseas members note we would really love to hear from you as well.....just think what observations from Britain, Germany, Denmark, Slovakia, the Czech Republic, Belgium and the Netherlands et. al. could add!)

Your editor is participating and I can encouragingly report that I love making time to tour our garden. It has always been especially enjoyable to look for signs of spring and to finally create some overdue records that will serve a purpose has been a reward indeed. Join us and we'll all learn.

Cyrtomium Macrophyllum

James R. Horrocks
Salt Lake City

Cyrtomium means “sickle-shaped” and *macrophyllum* is literally “large-leaved”, a rather descriptive name for this species. The Large-Leaved Holly Fern is rather slow growing, producing two to four sub-evergreen fronds in a season with two to eight pairs of pinnae. It is generally like *C. caryotideum*, but lacks the auricles or lobes and has fewer segments. The pinnae are quite large and of a light yellowish green color. This fern is medium sized and frequents the forest floors of Japan, Taiwan, China, and the Himalayas to northern India. Because of its rounded pinnae, it is not likely to be confused with other members of the genus. One variety exists, *C. macrophyllum* var. *micro-indusium* with pinnae that are not quite as large or ovate. Formerly, *C. turkusicola* or *C. tukusicola* was considered a variety, but is now regarded as a separate species, being closer in form to *C. fortunei* or even *C. falcatum*, with overlapping pinnae.

Description: The rhizome is compact and erect. The stipes are from six to twelve inches long and are quite scaly below, the scales being narrowly ovate to linear-lanceolate and abruptly acuminate. The upper scales gradually narrow. The arching once-pinnate fronds are up to two and one-half feet in length and rather spreading, being six to ten inches wide. The fronds are produced sparsely, perhaps two to four in a season, occasionally more. The pinnae can number up to eight pairs and are thinly chartaceous. The upper pinnae are ovate to oblong-ovate, abruptly acuminate, and usually rounded at the base. The pinna stalks are short and the pinnae vary, being slightly unequal. The margins are smooth, ending in a very short point. The lower pinnae are larger and can be four to eight inches long and up to three inches wide. The terminal pinna may be entire or end in a rather pronounced tri-cleft. The sori are scattered, as in other *Cyrtomiums* and the indusia are nearly entire.

Culture: *Cyrtomium macrophyllum* is rather easy to grow, not being particularly fussy about soil types. The soil, however, should be rich in humus content. It is quite hardy in zone 6 and has been reported to be growing outside at the Munich Botanical Gardens in Germany. It is fairly early in its emergence in the spring, therefore protection is needed from frosts. The large bold fronds, with their rounded pinnae, contrast nicely with more delicately cut species. *Cyrtomium macrophyllum* prefers shade with perhaps a little morning sun. It is quite attractive but is often the subject of the query: “Is that really a fern?” For something really different and, I suppose, “un-fern-like”, the Large Leaved Holly Fern is an interesting garden subject.

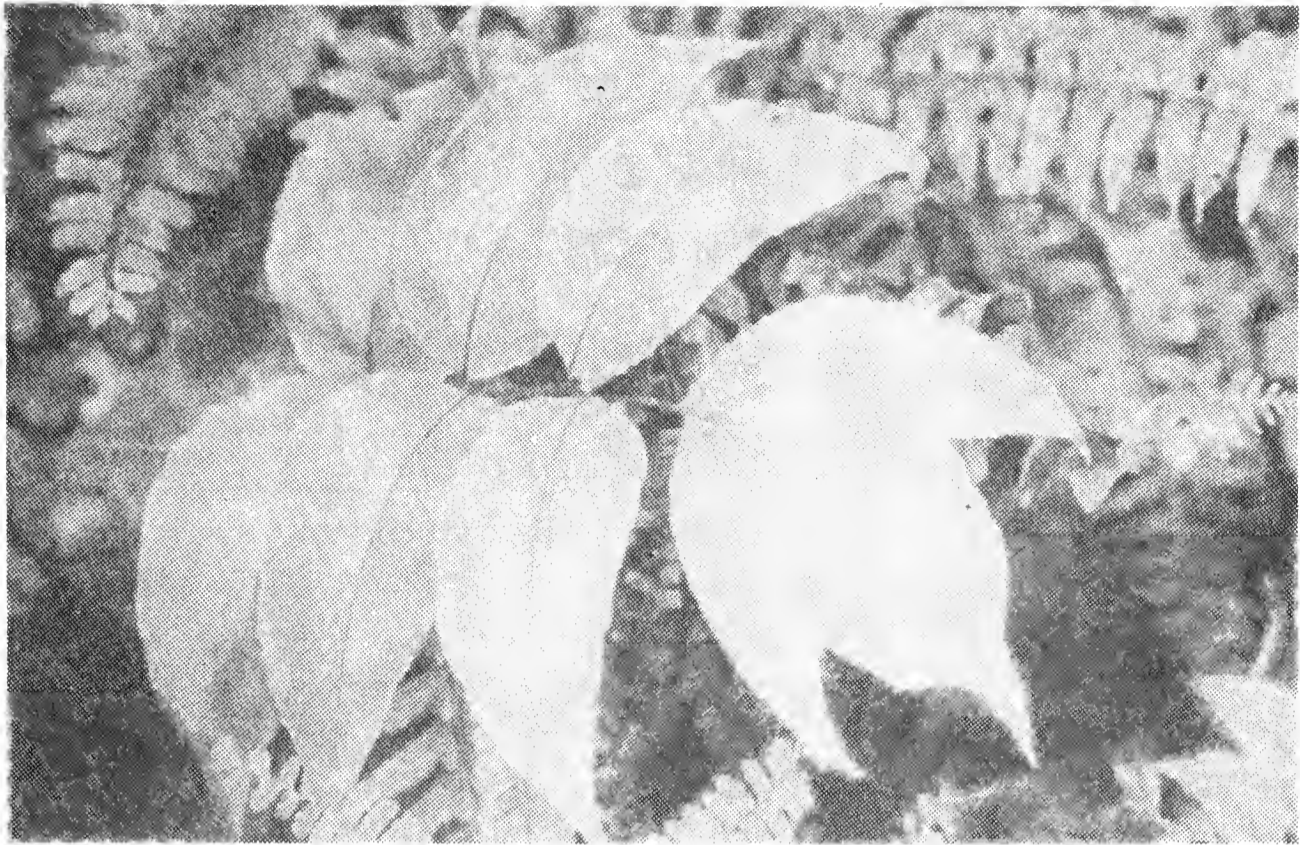
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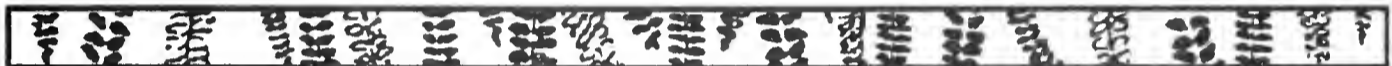
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Cyrtomium macrophyllum. Photo by Richard Young - Salt Lake City, UT.



Hardy Fern Foundation Field Trip

Join Dr. Art Kruckeberg, Professor Emeritus, Botany, University of Washington, for an HFF field trip into the fern rich areas of the North Fork of the Teanaway River in Washington's Wenatchee Mountains.

Date: Sat. July 14, 2001

Meet at the Cle Elum Ranger Station in Cle Elum at 9:00 A.M.

(There are several motels and a bed and breakfast in Cle Elum. Last year's participants enjoyed comfortable and reasonable accommodations at the Stewart Lodge, 805 West First St., Cle Elum, WA 98922. 1-800-233-5358. Advance reservations are **STRONGLY** recommended.)

Among others, we will be hunting for *Polystichum lemmonii*, *P. scopulinum*, *Polystichum* hybrids, *Cheilanthes gracillima*, *Aspidotis densa*, *Woodsias*, *Cryptogramma acrostichoides* and the serpentine form of *Adiantum aleuticum* as well as some of the more familiar and common ferns of the state. Art is an authority on all aspects of our native flora and is an energetic and enthusiastic field guide. This promises to be a very special trip and we hope you can join us. (Bring a sack lunch and beverage.)

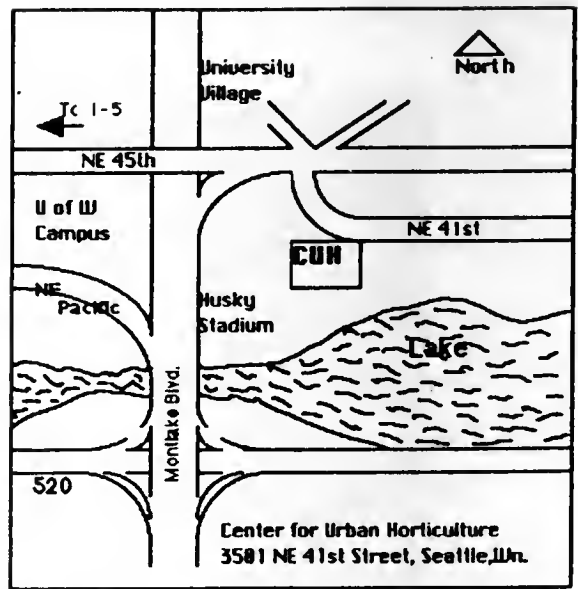
Registration fee of \$15.00 per person should be mailed in advance (to arrive no later than July 9) to:

Michelle Bundy
1716 S. 223rd St.
Des Moines, WA 98198

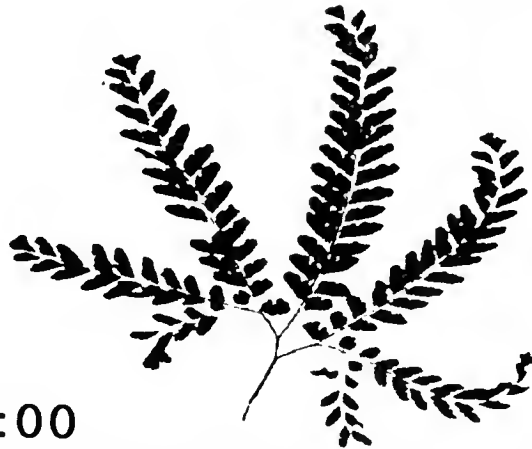
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