

CHINQUAPIN

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Earl Core Student Award Report

The effect of wild boar (*Sus scrofa*) rooting on plant biodiversity in high-elevation beech forests of Great Smoky Mountains National Park.
by Alexandra Kay

Alexandra (Lexi) Kay (Elon University) received the Earl Core Student Award in 2008 and has been gracious enough to share this summary for her work.

In the spring of 2008, I was awarded the Earl Core Student Award from the Southern Appalachian Botanical Society to support my work in high elevation beech gaps of the Great Smoky Mountains National Park (GRSM). I was interested in how rooting behavior of the invasive European Wild Boar (*Sus scrofa*) was affecting plant diversity in these forests.

Since its introduction to North Carolina in 1912, the European wild boar (*Sus scrofa*) has invaded the Southern Appalachians and spread throughout GRSM (Howe 1975). Its foraging behavior, which is heaviest during the summer months in high elevation beech gaps and oak stands with herb-rich understories, leads to the destruction of wildflowers, tree roots, and tree seedlings. As such, we expected to find that long term hog rooting leads to significant changes in groundcover composition in high-elevation beech gaps.

We used seven permanent, fenced hog enclosures located in high elevation beech gaps throughout the park to make comparisons between rooted and unrooted forest. The enclosures were constructed in the 1980s, and each was paired with at least one adjacent, unfenced control plot. The Carolina Vegetation Survey Protocol was used to sample species richness in nested quadrats and cover at the module (100 m²) level. This method allowed us to compare mean species richness and mean cover values in enclosures and controls for all species and for herbaceous species across four plot groupings: all plots (20 enclosure, 29 control), Special Protection Area (SPA) only (12, 12), all plots but SPA (18, 24), and Double Springs (DS) only (2, 5). The SPA was analyzed separately because of its larger size and orientation across two separate gaps, and Double Springs (DS) was analyzed separately because it was the only location to show obvious signs of recent hog activity.

Our comparisons indicated that cover and richness values were always higher in enclosures when compared with controls (though the differences were not always significant). This was consistent across all plot groupings.

Hog rooting significantly reduced mean cover values for all species at the module level in three plot groupings: across all plots, in SPA only,

and in all plots but SPA (Figure 1). Furthermore, in areas with recent rooting (DS), mean species richness at the module level in enclosures was significantly higher than controls (Figure 2). Though no significant difference in mean cover for all species was detected in the DS plots, we expect a low statistical power prevented a true difference from being found. Finally, mean herbaceous cover was significantly reduced in enclosures in all plots and in SPA only, suggesting that differences in herbaceous cover in all plots are driven by differences in SPA only.

Our observations indicate that beech mortality caused by Beech Bark Disease may cause changes in understory composition that result in reduced hog activity. The future of herb populations and the role of hog rooting in beech gaps that continue to cycle through stages of beech mortality and recovery is unknown.

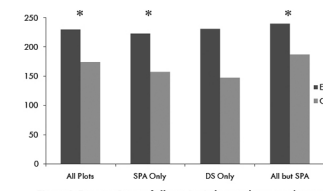


Figure 1. Percent Cover of all species in hog enclosure and control modules

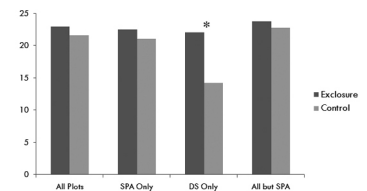


Figure 2. Species richness values for all species in hog enclosure and control modules



Photo by Richard Bartz, Wikipedia

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Elizabeth Ann Bartholomew

Award: accepting nominations

Purpose

Elizabeth Ann Bartholomew (1912-1985) served as the Secretary of the Southern Appalachian Botanical Club (now Society) from 1946 until 1981. Her life was devoted to plants, and she transferred her interest in plants and nature to students of all ages and walks of life.

The Southern Appalachian Botanical Society annually presents the Elizabeth Ann Bartholomew Award in memory of her untiring service to the public, to plant systematics, and to this organization. This award is presented to individuals who have also distinguished themselves in professional and public service that advances our knowledge and appreciation of the world of plants and their scientific, cultural, and aesthetic values, and/or in exceptional service to the Society.

To nominate a deserving colleague for the 2010 Bartholomew award, please go to the SABS website www.sabs.appstate.edu for an application form. Nominations are due February 1, 2010. SABS members may nominate more than one person.

Types of service rendered by nominee**Educational**

The nominee has served the public by organizing or leading field trips, conducting workshops, or delivering botanical/ecological lectures. Alternately, the nominee has written popular field guides, manuals, or textbooks, and/or technical usually color illustrated field books, guides, and articles.

Service to SABS

The nominee has provided commendable service to the Society in its activities and affairs.

Science

The nominee has provided curatorial service by maintaining collections and distributing specimens to the botanical community and/or conducted notable field research in plant

systematics and/or ecology, particularly in the Southern Appalachians and the southeastern United States.

Please note

The Elizabeth Ann Bartholomew Award will not be presented posthumously or jointly. Current members of either the Council or the Bartholomew Award Committee are not eligible.

Your nomination should include a list of names and contact information for at least five colleagues whom you believe would support this nomination with an enthusiastic letter of recommendation if contacted by the award committee.

Forward your nomination and supporting information by February 1, 2010 to:

Dr. Lisa Kelly, Chair
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University of North Carolina at Pembroke
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2009-2010 Bartholomew Award Committee

Lisa Kelly, University of North Carolina at
Pembroke, Chair (2007-2010)
Gary Dillard, Bowling Green, KY
(2008-2011)
Joe E. Winstead, Southern Arkansas Univer-
sity (2009-2012)

PREVIOUS AWARD RECIPIENTS

1989 Aaron J. Sharp
1990 Wilbur H. Duncan
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1993 Roy B. Clarkson
1994 James W. Hardin
1995 James F. Matthews
1996 John M. Herr, Jr.
1997 Donna M. E. Ware
1998 J. Dan Pittillo
1999 Dan Evans
2000 C. Ritchie Bell
2001 R. Dale Thomas
2002 William H. Martin
2003 no award
2004 W. Eugene Wofford
2005 Gary Dillard
2006 Joe E. Winstead
2007 Angus K. Gholson, Jr.
2008 Michael J. Baranski
2009 Charlie Williams

Botanical Excursions

by George Ellison

Shrub Yellowroot & Cherokee Baskets

By George Ellison

Shrub yellowroot (*Xanthorhiza simplicissima*) is one of the more distinctive plants found in the southern mountains and adjacent areas. In places it is quite common, occurring in dense tangles along the shaded banks of most streams here on the North Carolina side of the Great Smokies where my wife, Elizabeth, and I live.

Yellowroot is a member of the Buttercup Family (*Ranunculaceae*) that is botanically distinct due to its handsome tassel of flowers and the strategies it has devised for seed dispersal. It is both economically and socially important because of the yellow dye Cherokee women extract from the plant's pulverized stems and rootstock.

Yellowroot flowers from early to mid-spring. Watch out for a plant about 8- to 24-inches high that looks (to me) like a miniature palm tree or maybe carrot tops; that is, all of the leafy green growth is more or less at the very top of stem.

The inflorescences consist of graceful narrow racemes about 5-inches or somewhat longer in length. These are usually dependent or drooping, but they can sometimes be almost upright or waving (as in Elizabeth's illustration). Individual flowers consist of five purplish-brown to yellowish-green sepals (no petals) about a half-inch in diameter. Each one displays a bright yellow dot in its center that attracts insects.

Yellowroot plants almost always form colonies with extensive integrated root systems. These systems help the plant maintain a foothold when flooded. Another flood-disaster prevention feature is the bare flexible stem that offers little resistance to raging water. The yellowish follicles (fruits) produced in summer disperse seeds that float merrily away. These factors explain why the plant favors a streamside habitat and how it readily becomes established downstream.

Scrape some bark off the root (or stem) with your fingernail and you'll find that the generic designation is perfect: "*Xanthorhiza*" = "yellow foot." The tissue just under the bark is a bright yellow hue that rivals the color of fine butter.

I sometimes chew peeled yellowroot stems when I have a bad taste in

my mouth and need to freshen up. And a hot tea rendered from the crushed rootstock generally helps settle my stomach when need be.

Cherokee women have for hundreds of years used the pulp rendered from the plant's rootstock to tint the honeysuckle, white oak or river cane splints they weave into traditional baskets. To their credit, they continue to do so in an era when their economic culture is dominated by casino gambling and related activities. Making baskets, carving wood and stone, dancing the old dances, harvesting traditional edible or medicinal plants, telling the ancient stories: all ways of keeping a traditional culture alive and well.

Martha Ross, a resident of the Big Cove Community on the Qualla Boundary, and her three sisters — Maggie Lossiah, Jane Taylor, and Dorothy Thompson — all learned basket making from their mother, Charlotte Lossiah. Their basic dye colors and plant sources have always been: yellow (shrub yellowroot); reddish-orange (bloodroot); black (butternut walnut); and brown (black walnut).

"Mother didn't use yellowroot as a dye too much except with honeysuckle," Mrs. Ross told me many years ago. "She liked to use bloodroot. But I like yellowroot. We also use butternut and

walnut. You can get yellowroot anytime, but it's best in spring when you get a brighter color. It's a little dull in winter. The roots can be used if you beat them with a hammer, but I like the stems to get the prettiest yellow.

"You scrape the pulp into a kettle of boiling water on the stove. Pull the splints out to the edge so that the yellow fills up a little hole in the center. After 30 or 40 minutes it's ready. I never dye a big batch at once, just enough to make a few baskets."

www.georgeellison.com

www.elizabethellisonwatercolors.com



Taxonomic Advisory!

by Alan Weakley

Plant species and varieties, “through a glass, darkly”

A factor that contributes mightily to changes in scientific names is the unsettled state of taxonomic ranks and the criteria that should be applied to determine them. What is a species? What is a variety? What is a subspecies?

First, what is a species? Judd et al. (2008) artfully define species in their glossary as “a basic grouping of organisms” [uh, okay, but...], before referring the reader back to a several page discussion in the text of various “species concepts:” the theoretical basis for determining whether two plants are or are not members of the same species.

The Judd et al. (2008) summation of seven species concepts is here paraphrased:

1. *Biological* – based on a “gap in interfertility between species.”
2. *Recognition* – based on a “gene flow as a cohesive force maintaining the similarity of individuals within a species.”
3. *Phenetic* – based on a “gap in the variation between species.”
4. *Evolutionary* – based on “common evolutionary fate through time.”
5. *Apomorphy* – based on monophyly, that a species “contains all descendants of one ancestral population and is identifiable by autapomorphies [derived character states restricted to a single taxon].”
6. *Diagnosability* – based on a “unique combination of [invariant] character states.”
7. *Genealogical* – based on “basal exclusivity.”

But no one of these species concepts can be effectively applied universally (even in theory) because of the diversity of evolutionary mechanisms in different groups of plants. And then we get to the practical issues...

The recognition of species involves our deduction of and circumscription of “basic groupings of organisms” from data we can directly observe. The data to be used differ from one species concept to another, and the means of the deduction and inference also differ. Some species concepts (biological, recognition) require us to have sophisticated information about the population biology and gene flow between a putative species and its relatives or that we determine the interfertility of a putative species and its relatives, but of the approximately 10,000 vascular plants in eastern North America, few have been studied in this manner. Other species concepts (phenetic) require careful study of (mainly morphological) variation, and while this is relatively straightforward, it is likewise a monumental and far from complete task for 10,000 species of eastern North American vascular plants. The remaining species concepts involve the deduction of the historical evolutionary tree from either morphological or molecular data (or both), while the evolutionary species concept seems to expect knowledge or inference of the future (“fate”) as well as the past.

So it is no wonder that different taxonomists take different philosophical approaches to delineating species, and that even when they are in agreement about philosophy, may use different data, or weight various factors differently, and come to different conclusions about the “basic groupings of organisms.”

Judd et al. (2008) suggest four guidelines for recognizing plant species, “aimed at making it easier to recognize plant species.”

1. Get to know the plants in the field.
2. Collect data on morphological variation, molecular variation, breeding systems, flowering times, pollination, ecology, distribution, and gene flow.
3. Analyze systematic data rigorously and display the results graphically to facilitate their interpretation.
4. Hypothesize speciation scenarios and test them by observation and experimentation.

Great advice, but not a simple matter to carry out!

Let us despair, it is comforting to see that many eastern North American plant species are straightforward and uncontroversial, on which all or nearly all combinations of species concepts, taxonomists, and data sets concur: there are no arguments about *Quercus alba* and *Tsuga canadensis*. But, an actual majority of species in the eastern North American flora have either had “lumping and splitting issues” — 48.8% have changes in taxonomic concept or circumscription since J.K. Small (1933) and M.L. Fernald (1950) — or have been variably treated as species by some authors and as infraspecies (varieties or subspecies) by others (30.4% with changes in rank), or have had both types of change (Weakley 2005).

Linda Chafin’s column in this issue (see p. 6) is about one of the straightforward and uncontroversial species: *Ruellia noctiflora*, which recent taxonomists have unanimously regarded as a species. One reason why “correct” taxonomy matters at more than an academic level is that conservation decisions depend on taxonomic understanding. The recognition of *R. noctiflora* as a “good” and uncontroversial species means that it can be afforded legal protection at state or federal levels, and that conservation agencies and organizations are willing to target it as a conservation priority and expend resources for its conservation. If it were a good species, but unrecognized, it would not be a conservation target; while, if it were not a good species but was erroneously recognized as one, it might receive conservation attention and resources that were unwarranted relative to its biological significance.

One has to look no further than other eastern North American *Ruellia* to see controversies of lumping and splitting, and differing opinions about taxonomic rank that remain to one degree or another unresolved. Fernald (1945, 1950) recognized seven varieties in *R. caroliniensis*; these have been pretty universally ignored or rejected since. Long (1970) additionally regarded the Southeastern Coastal Plain plant *R. ciliosa* as a component of *R. caroliniensis*, erecting a complex quadrinomial system, treating it as *R. caroliniensis* ssp. *ciliosa*, and recognizing two varieties within it; all seven of Fernald’s varieties

were considered by Long to belong to *R. caroliniensis* ssp. *caroliniensis* var. *caroliniensis*.

Fernald (1945, 1950) also recognized 5 varieties in *R. humilis*, and these have sometimes been at least partly accepted since; much additional study is needed to come to more definitive conclusions about these varieties, which do seem to show some correlation of morphological characteristics and geography.

Fernald also recognized three species which he regarded as allied to one another, but geographically separated (or nearly so): *R. pedunculata* of the Midwest (Illinois and Indiana south to Louisiana and Texas), *R. purshiana* of the Southern and Central Appalachians (Maryland south to Alabama), and *R. pinetorum* of the Southeastern Coastal Plain (South Carolina south to Florida, west to e. Texas). Later authors have treated these three putative taxa as one species (without infrataxa), as two species (one with two subspecies), or as three species, this last approach seeming to be the emerging consensus of those most familiar with the genus.

So what are subspecies and varieties — other than something less than the “basic groupings of organisms”?

Small (1933) wrote the following in his preface:

In the matter of the interpretation of species and genera what has seemed to the author a balanced course has been followed – traditional “lumping” and modern “splitting” have not influenced the treatments of the various groups.... Species have been interpreted in the broader sense; minor variations of species, “varieties” or “subspecies” have not been considered to any great extent. “Subvarieties,” “forms,” “subforms” have not been considered at all.

Given Small’s reputation as a splitter, many later authors might smile at Small’s contention that he has interpreted species “in the broader sense.”

Fernald (1950) also addressed the topic:

Much more definite ... are the terms species, variety and form. The SPECIES is conceived as a series of individuals (usually numberless) occupying, until disturbed by man’s activity, a natural geographic area and having essentially identical morphological characters of flower, fruit or reproductive structure, somewhat exemplifying the biblical definition, “It is by their fruits ye shall know them”, for most critical taxonomic study starts, when possible, with flower, fruit, seed or spore. As here used, the term VARIETY, i.e., VARIETAS (as opposed to any sort of variation or fluctuation) refers to a geographic variety, a strongly fixed variation of a species with the essential reproductive parts unchanged but showing somewhat constant departures in size of parts, shape of leaves, or modification of the less fundamental parts of the flower, etc., and occupying a somewhat segregated geographic area...

Traditionally, varieties were used in botany as the sole or at least primary infraspecific category, but over the last two to three decades, the use of the subspecific rank has become more fashionable. Looking at the ultimate (finest scale) taxonomic units used, Small (1933) uses species for 97.6%, subspecies for 0.3%, and variety for 2.1%; Fernald (1950) uses species for 63.7%, subspecies for 0%, and variety for

36.3%; whereas Flora of North America (1991 et seq.) uses species for 78.8%, subspecies for 7.6%, and variety for 13.6%. Looking across different periods and different botanists, it is clear that the two infraspecific categories of subspecies and variety have no consistently different meaning, and it is also clear that we will see additional rank changes as botanists apply variable criteria to imperfect data about complexly variable plants.

Although species may be the basic groupings of organisms and therefore our effort to understand and delineate them is fundamental to our science and conservation, “for now we see through a glass, darkly.”

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Photograph of *Ruellia caroliniensis* with bee by Dan Pittlillo



Rare Plants

by Linda Chafin

Night-blooming Wild Petunia: Hawkmoth-lover of the Flatwoods

National Pollination Week, June 22-28, has just passed, bringing to my NPR station programs bearing wondrous tales of tightly coevolved plant and animal relationships (as well as depressing facts about habitat loss, pesticide abuse, and bee colony collapse disorder).

One of these stories featured “sphingophiles,” or hawk-moth lovers, the group of plants whose flowers are highly evolved to attract hawkmoths (family Sphingidae), reward them for their nocturnal foraging efforts, and shower their scaly bodies with pollen. These plants occur in widely dissimilar families and far flung portions of the globe, including (among many others) moonflower (Convolvulaceae), four o’clocks (Nyctaginaceae), jasmine (Oleaceae), gardenia (Rubiaceae), flowering tobacco and jimsonweed (Solanaceae), oleander and star-jasmine (Apocynaceae), and many orchids, cacti, and amaryllids.

Night-blooming wild petunia (*Ruellia noctiflora*, Acanthaceae), a species that occurs in the lower Coastal Plain of the southeastern U.S., is a hawkmoth-lover. Its flowers share most of the traits common to those of hawkmoth-loving plants: they are white and open at night to release a strong, sweet perfume. They have a long, nectar-containing floral tube but no “landing platform.” And they produce abundant nectar (from a ring of nectaries that encircle the base of the ovary) that has less concentrated sugars than the nectar produced by bee-pollinated flowers; this thin liquid is easily drawn up the long, slender proboscis of the hawkmoth. As the hawkmoth retracts its proboscis and retreats from the flower, both its body and proboscis are dusted with pollen, which it then (hopefully) carries to the flowers of another plant in this species.

Sphingophilous flowers like those of night-blooming wild petunia are seldom pollinated by other pollinators. Butterflies are attracted to colorful flowers, and hummingbirds usually arrive too late. The latter may visit these flowers in the early morning before they wither but often only after hawkmoths have already carried off the pollen and nectar. Unlike highly territorial hummingbirds, hawkmoths visit flowers over a wide area and are therefore more effective at promoting gene flow between populations.

Although vulnerable to the loss of its specific pollinator, night-blooming wild petunia’s rarity is due largely to destruction of its habitat. It occurs in wet pine flatwoods and savannas and, occasionally, in low, wet hammocks; these habitats have been widely converted to slash pine flatwoods or ditched and drained for development. In each of the states where it is known – South Carolina, Georgia, Florida, Alabama, Mississippi, and Louisiana – night-blooming wild petunia is imperiled or critically imperiled. It was last seen in Georgia 45 years ago.

Night-blooming wild petunia stands 30 - 40 cm tall and has opposite, sessile, elliptic or lanceolate leaves. Its flowers, opening May-August, are a glistening white, up to 10 cm across, and have a tube and throat 8 - 10 cm long. The sepals are up to 28 mm long, very narrow, and persistent on the fruit. The flowers wither and fall off by mid-morning.

According to a wonderful poem by Marilyn Nelson, part of a cycle of poems celebrating the life of George Washington Carver, this species and its nocturnal visitors delighted the great plantsman:



“... he suddenly sensed a fragrance
and a small white glistening.
It was clearly a petunia:
The yellow future beckoned
from the lip of each tubular flower,
a blaring star of frilly, tongue-like petals.
He’d never seen this species before.
As he tried to place it,
its flowers gaped wider,
catching the moonlight.
suffusing the night with its scent.
All night he watched it
promise silent ecstasy to moths.”

(Excerpted from “*Ruellia Noctiflora*” from Carver: A Life in Poems by Marilyn Nelson. (Front Street, an imprint of Boyds Mills Press, 2001.) Reprinted with permission. Text copyright © 2001 by Marilyn Nelson.)

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Mystery Plants

by Dan Pittillo

Last issue's—17(1)—answers: N^o. 1, the twigs are likely familiar to most folks, at least when they leaf out. The tree was *Carya cordiformis*, bitternut hickory, a close relative of pecans (it has thin husks and rather thin shells, making it easy to crack; indeed, I can easily crack them with a little stomp).

N^o. 2, the vine is the bane of over 75% of our population, *Toxicodendron* (or *Rhus*) *radicans*, poison ivy. If I'm out pulling weeds in early spring or winter, and see that naked bud folded like a folded chicken's or bird's foot, I know it is poison ivy and take precautions. I hope all that have that allergy learn its twig without error.

Tracy Roof and *Allen Sweetster* were the two that got these correct based on images and clues.

This is a pair that could stump about any botanist without some clues. Maybe more folks will be able to identify these two rosettes in this summer contest. They are quite similar in appearance but do have some significant differences:

N^o. 1 is a native perennial species found throughout the East though in some different forms or varieties.

N^o. 1

N^o. 2 is an invasive exotic that has been spreading widely throughout the East since its introduction in New York as culinary herb in the 1800's and occurs as far west as Oregon and north as Alaska.

N^o. 2



Field Notes: On maidenhair ferns

Your *Chinquapin* editor has been working in southeast Alaska since early April and has been seeing northern (or western) maidenhair fern (*Adiantum aleuticum*) nearly every day. I've been asking myself, every time I see it, just how is this different from the maidenhair fern (*Adiantum pedatum*) from eastern of North America?

I've read just about everything I can find on this genus, including Cathy A. Paris and Michael D. Windham's *A Biosystematic Investigation of the Adiantum pedatum Complex in Eastern North America* where they state "no single character is diagnostic" as well as David Lellinger's *A field manual of the ferns & fern-allies of the United States & Canada*, but find this statement from the 1993 treatment in the *Flora of North America* interesting, if not illuminating:

Although the western maidenhair has traditionally been interpreted as an infraspecific variant of *Adiantum pedatum*, the two taxa are reproductively isolated and differ in an array of morphologic characteristics. Therefore, they are more appropriately considered separate species (C. A. Paris and M. D. Windham 1988). Morphologic differences between *A. pedatum* and *A. aleuticum* are subtle; the two may be separated, however, using characteristics in the key.

I'm sorry folks, but I just don't see the difference! After four seasons of looking at this fern from Alaska, I simply see no differences that make it distinctive enough to call it a "good species". Even the statement "reproductively isolated" seems questionable. Just look at any distribution map of the two species you care to and there is overlap. The key from FNA is a good example of what happens when a "fine" a distinction is made between species:

Segments at middle of penultimate divisions of blades generally less than 3.2 times as long as broad, apices with rounded, crenulate or crenate-denticulate lobes, lobes separated by shallow sinuses 0.1–2(–3.7) mm, segment stalks ca. 0.6–0.9 mm.....*Adiantum pedatum*

Segments at middle of penultimate divisions usually more than 3.2 times as long as broad, apices with sharply denticulate, angular lobes, lobes separated by deep sinuses 0.6–4 mm, segment stalks to 0.6 mm.....*Adiantum aleuticum*

In their treatment of the genus, no other species in this genus are separated on such fine morphological characters.

Weakly (2008) separates them similarly, if not geographically:

Ultimate segments at middle of penultimate divisions usually > 3.2× as long as broad, the apices with sharply denticulate, angular lobes, these lobes separated by deep sinuses 0.6–4 mm deep; segment stalks 0.2–0.9 (–1.3) mm long; [disjunct in se. PA on serpentine from a generally more northern and western distribution] [*A. aleuticum*]

Ultimate segments at middle of penultimate divisions usually < 3.2× as long as broad, the apices with rounded, crenulate, or crenate-denticulate lobes, these lobes separated by shallow sinuses 0.1–2.0 (–3.7) mm deep; segment stalks 0.5–1.5 (–1.7) mm long.....*A. pedatum*

I do not see these as different. I consider this a *mildly* variable circum-boreal species. The same fern Vitus Bering and Georg Steller saw in St. Petersburg, Russia on their way to Alaska in 1741, is the same one I see in southeastern Alaska and the north Georgia mountains.

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