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Earl Core Student Award Report

JOY van DERVORT-SNEED (Appalachian State University) received the Earl Core Student Award in 2006 for *Species delineation of two imperiled wild gingers (*Asarum contracta *and* Asarum rhombiformis*) using morphology, molecules and pollinators*. Joy has been generous enough to provide this summary.

I received an Earl Core Student Award from the Southern Appalachian Botanical Society in 2006. The award allowed me to conduct vegetation surveys of co-occurring plant species for eight populations of *Asarum rhombiformis* and three populations of *A. contracta* (previously known as *Hexastylis rhombiformis* and *H. contracta*.) Within each population, one 20 m x 50 m plot was constructed and the co-occurring vegetation was sampled using the protocols and techniques established by the Carolina Vegetation Survey (Peet et al. 1998). The data from the vegetation surveys were combined with molecular and morphological data to explore the species boundaries of *A. contracta* and *A. rhombiformis*.

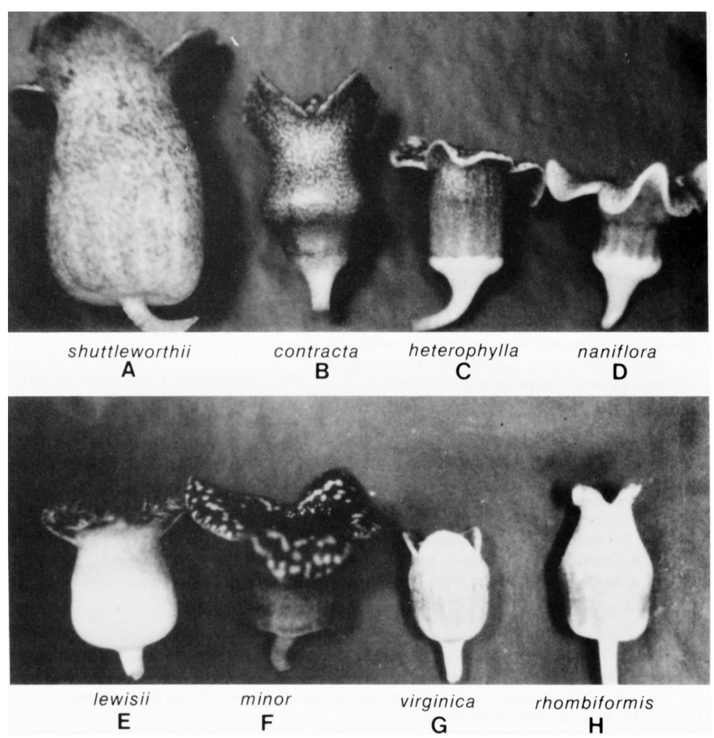
From the *A. rhombiformis* populations there were 48 plant species found exclusively in one or more *A. rhombiformis* populations. There were only 10 plant species found exclusively in *A. contracta* populations. The most common species found to co-occur in both *A. contracta* and *A. rhombiformis* populations were *Acer rubrum* L., *Galax urceolata* (Poiret) Brummitt, *Goodyera pubescens* (Willdenow) R. Brown, *Kalmia latifolia* L., *Liriodendron tulipifera* L., *Nyssa sylvatica* Marshall, *Oxydendrum arboreum* (L.) de Candolle, *Polystichum acrostichoides* (Michaux) Schott, *Quercus alba* L., *Rhododendron maximum* L., *Smilax rotundifolia* L., and *Tsuga canadensis* L. (Newcomb 1977, Weakley 2007; Table 1). *Magnolia fraseri* Walter and *Quercus rubra* L. were found in all of the *A. contracta* populations and some but not all *A. rhombiformis* populations. The mean number of co-occurring plant species for *A. contracta* and *A. rhombiformis* were tested for significant differences using a t-test. The eight populations of *A. rhombiformis* had a mean of approximately 39 co-occurring plant species, while the three populations of *A. contracta* had a mean of approximately 37 co-occurring plant species.

To determine how similar populations of *A. contracta* and *A. rhombiformis* were in co-occurring species, a Sorenson's Index of Community Similarity was used. This study found that, *A. rhombiformis* and *A. contracta* populations were 67% similar in species. Individual populations of *A. rhombiformis* varied from being 36% -69% similar. The *A. contracta* populations ranged in similarity from 48% - 49% similar in co-occurring species.

Studies have shown how species exhibit niche partitioning when growing in close proximity to other similar herbs (Graham et al. 2004, Queenborough et al. 2007). The Sorenson's Index of Community Similarity and the t-tests performed in this study did not show that *A. contracta* and *A. rhombiformis* exhibited niche partitioning. The ecological parameters of co-occurring plant species did not appear to exclude *A. contracta* and *A. rhombiformis* from growing in the same habitats in southwestern North Carolina. However, microhabitats were not examined and the soil characteristics which Padgett (2004) found to be a good indicator for the niche partitioning of the *Heterophylla* species complex within *Asarum* was not measured here and should be examined in the future.

Editor's note: The illustration below is from L.L. Gaddy's A Review of the Taxonomy and Biogeography of *Hexastylis* (Aristolochiaceae) from *Castanea* Vol. 52, No. 3 (Sep., 1987).

The nomenclature of the *Asarum-Hexastylis* complex is messy. Weakley notes in the 2008 version of his flora "I choose here to follow the more traditional (at least in our area) separation of *Hexastylis* from *Asarum*, until and unless stronger evidence is presented for their combination. Electrophoretic and morphologic studies currently in progress validate the taxonomy presented, insofar as results are available."



A New Technique for the Preparation of Herbarium Specimens of Fresh Water, Filamentous, Colonial, and Unicellular Algae

by J. M. Herr, Jr.

In 1992 (Biotechnic & Histochemistry 67(1): 9-13), I reported that throughout the first half of the 19th century, microscopists were in diligent search for mounting media which would preserve whole mount and hand sectioned specimens on microscope slides. In 1841, Professor P. Harting of Utrecht introduced calcium chloride solution as a superior mounting medium. Von Mohl considered solutions of calcium chloride as superior to all other media used at that time. The hygroscopic nature of calcium chloride negates the need for hermetically sealing the preparations, and slides prepared in 1848 by Hermann Schacht and Ernst Hallier, students of Jacob Schleiden, are still in good condition in the Museum for the History of Science in Leiden (The Netherlands). Glycerin, introduced as a mounting medium in 1849, gradually and unfortunately eliminated use of calcium chloride solutions which have recently been shown to be especially superior for slide mounts of plant tissue treated with staining procedures developed in the 20th century. The report offered here will perhaps be considered still another valuable use for calcium chloride as a preservation and mounting medium for fresh water algae. Since this medium in no manner compromises the structural integrity and identity of filamentous, colonial, and unicellular forms, collections of these forms permanently stored in a 20% solution of calcium chloride can be maintained in a herbarium.

Collect a sample of an alga in water from its habitat. Unicellular and colonial forms will require gentle centrifuging to concentrate the collection. Replace the water with Carnoy's fixative (100% ethanol and glacial acetic acid, 3:1) for 15 to 60 minutes. Replace the fixative with 70% ethanol for brief or long-term storage. If this collection were processed unstained for permanent maintenance in calcium chloride, the cell structure clues for identification would be easily recognized. Cell walls, plastids, nuclei and nucleoli, and ergastic substances would contrast one from another in various shades of gray. The same level of contrast would be maintained if the algae were stained either at this point or later when the storage ethanol is replaced with water.

To stain the material at this point, replace the storage ethanol with a 0.5% solution of fast green in 70% ethanol (5 mg stain/100 ml ethanol) for 5 minutes. The optimal time for staining may vary considerably according to species. Replace the staining solution with water. A most important point to note is that once the specimens are fixed, transfer from alcohol to water and on to a calcium chloride solution can be immediate without the danger of plasmolysis.

Accordingly, for aqueous staining or storage unstained in 20% calcium chloride, replace the 70% ethanol with water. If stained specimens are intended at this point, replace the water with, for example, aqueous 0.05% toluidine blue O for 1 to 3 minutes. Replace the stain with water.

Transfer a large sample of the collection to a 1.5 ml polypropylene, flat top microcentrifuge tube and use a Pasteur pipette to remove water from the tube. Finally, cover the algal material with 20% calcium chloride, close the flat top, and inscribe with an indelible marker a number which provides identity to that collection. Use any remaining portion of the material to identify the algae in the collection which may contain more than one species. If such is the case, then the numbered tube will be comparable to older herbarium specimens that display more than one species on a sheet. For the initial identification, transfer some of the collection with a few drops of 20% calcium chloride to a slide, cover, and observe with bright-field optics. If this slide is t be kept permanently, it should be stored as described later for annotation slides. The identity of the specimen, date and location of the collection, and collector=s name should be kept as a numbered item in a file, preferably in the data base for the herbarium where the specimen will reside.

The tubes can be kept in special trays easily constructed from a : inch plywood board in size 162 x 123 inches. Side guard strips of wood : inch wide and 2 inch high are attached by glue or nails to the right and left long margins of the board. Use a 7/16 inch drill to drill holes through the board in horizontal and vertical rows : of an inch

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Botanical Excursions

by George Ellison

On Acorns

"What hale, plump fellows acorns are! They can afford not to be useful to me—not know me or be known by me. They go their way, and I go mine. Yet sometimes I go after them . . . I love to handle them and am loath to throw away what I have in my hand." – Henry David Thoreau

Acorns are elegant. They are one of our most beautiful natural structures. But they are sometimes produced in such numbers that we tend to take them for granted. Like Thoreau, however, I remind myself each fall to pick up some of the ones encountered so as to pay closer attention.

One can't help but admire an acorn's economy of form. The rough-textured cap is an enlarged and stiffened version of the small, overlapping leaves that protected the female flower before it blossomed. The smooth-textured nut is the flower's ovary, grown large and hardened into a protective shell around the single seed within.

A white oak 24 inches in diameter can produce 2,000 or more acorns per year. But as most everyone is aware several years may pass without any mast at all. It takes a lot of energy to bear reproductive structures. Oaks and many other plants "discovered" long ago that it's generally most beneficial to bear profusely one year, saturate the environment, and then lay low for a few years.

This strategy contributes to lean mast years that harm numerous animals that have become dependent upon acorns. Before the American chestnut was eliminated as a significant mast producer during the early twentieth century, it may have helped to alleviate this situation. I have read that chestnut trees in their heyday tended to bear more evenly from year to year, thereby offsetting the lean-year mast-bearing cycles of the oaks and other nut-bearing trees and shrubs.

Numerous plants and animals have evolved relationships that are mutually beneficial. None is more effective than the one forged between gray squirrels and oaks. Unlike red squirrels ("boomers"), which primarily feed on seeds from conifers like eastern hemlocks, gray squirrels almost seem to have been trained to propagate oak trees. It carries each nut from 50 to 100 feet from its parent, scratches a hole of just the right depth in the soil, deposits the seed therein, and carefully covers it with soil. This process is repeated endlessly so that gray squirrels never recover via smell and memory all of the acorns they plant.

Another prolific distributor of acorns is the blue jay, which can carry two acorns at once: one in its throat pouch, one in its mouth.

There are many other animals that eat acorns: bears, raccoons, birds, and us human critters. Humans aren't big acorn eaters these days, but the early European settlers and all the Indian tribes once consumed them in considerable numbers, having devised different methods for leaching out the bitterness.

According to Thomas E. Mails' The Cherokee People (1992), that tribe used acorns "dried, hulled, and pounded. The meats were then put into a leaching basket, and a cloth was tied over the top. Water was dripped on the cloth throughout the night, soaked into the meal, and then ran out through the bottom of the basket. The strong, bitter taste of the original acorn was removed, and the final product could be rendered into bread."

Acorns in the white oak group (rounded leaf lobes) contain less tannin than those in the red oak group (sharp-pointed leaf lobes) and are preferred. They are rich in both fats and carbohydrates. If you're interested in current methods for rendering acorns into palatable foodstuffs, consult Rebecca Rupp's Red Oaks and Black Birches: The Science and Lore of Trees (1990).

Have you ever noticed the numerous tiny holes in acorns? Like squirrels, humans experienced in acorn gathering don't harvest those with small holes because they indicate the presence of acorn weevils and moths. Female acorn weevils drill holes in acorns with elongate snouts and lay their eggs therein. These hatch into grub-like larvae that feed on the acorn before emerging through yet another hole and falling to the ground.

Then, along comes a female acorn moth that lays its eggs in the weevil entrance and exit holes. These hatch into larvae that feed on what's left of the acorn meat. Accordingly, it's not surprising that so many hollow acorns are encountered.

www.georgeellison.com

Drawing by Elizabeth Ellison
www.elizabethellisonwatercolors.com

Editor's Note: While on an All Taxa Biological Inventory (ATBI) fern foray up the Hyatt Ridge Trail in Great Smoky Mountains National Park on Labor Day weekend, my team needed hard hats to protect us from the onslaught of falling acorns from the northern red oaks! At least there the mast crop will be plentiful this fall.

Taxonomic Advisory!

by Alan Weakley

To include or not to include, that is the question...

In the last issue, we explored examples in which a seemingly distinctive monotypic species (or small genus) has been shown (usually with a combination of traditional morphological and molecular evidence) to actually be evolutionarily embedded in a larger genus, resulting in its inclusion in the larger genus. Generally, the recognition of the species as a monotypic or small genus has been based on a single, very striking or distinctive character, such as the fleshy, indehiscent fruits of *Belamcanda*, *Duchesnea*, and *Actaea* as compared to the dry, dehiscent fruits of *Iris*, *Potentilla*, and *Cimicifuga*, respectively.

In this issue, we will discuss a related, but different, situation: when a distinctive monotypic species (or small genus) has been shown to be most closely related to the larger group, but not evolutionarily derived from within its midst. In cladistic parlance, the species (or small group) is often termed "basal" or "sister" to the larger group. But the question becomes, is it the first branch within the group, or the first branch outside the group? As compared to last issue's situations, we are in murkier territory here, and in many cases there is no definitive right or wrong answer. I suspect this greater subjectivity will relieve some of you and trouble others! There is no grand committee that decides the true taxonomy, just the gradual, messy, sometimes contentious, scientific process of a hypothesis, an idea, being proposed, and over time (years, decades, centuries) it being evaluated, rejected, accepted, or modified.

Some suggestions have been made as to criteria to apply in making the decision about the inclusion (or not) of a basal branch; many but not all of the following criteria are from an excellent recent textbook, *Plant Systematics: a Phylogenetic Approach*, by Judd et al. (2008). Formal recognition of a basal branch would be favored by:

1. Definability. If the basal branch can be defined by a set of characteristics.
2. Presence of one or more obvious morphological (rather than molecular, anatomical, or obscure morphological) characteristics that distinguish it.
3. Larger size of the group.
4. Nomenclatural stability (or traditional recognition).
5. Evidence that is strong, unambiguous, certain, and unlikely to change in the future.
6. Greater age of the branch as a distinct clade.

It is apparent that these criteria are subjective, and may often be in conflict with one another, so even after applying these criteria differences of opinion will remain...

Hydrastis's search for a family

The eastern North American herb *Hydrastis canadensis* (Goldenseal) has often been described as occupying an intermediate position between the Berberidaceae and the Ranunculaceae, having some characters more typical of one family, and others more typical of the other. It has often been treated as part of the Ranunculaceae, sometimes as a monotypic family (or a family of two genera and two species, also including *Glaucidium palmatum* of Japan), and rarely as a component of the Berberidaceae. Though usually placed in the Ranunculaceae, Tobe & Keating (1985) present evidence from morphology, anatomy, embryology, palynology, chemistry, and cytology that suggests that Hydrastis is best recognized as a monotypic family. They contend that "*Hydrastis* represents a relictual primitive group which very early diverged from a common ancestral stock of Ranunculaceae, Berberidaceae and probably of Circaeasteraceae, and that Hydrastis has evolved in its own evolutionary line parallel with other lines leading to the modern representatives of these families." In recent papers on classification of the flowering plants, Thorne (1992) and Reveal (1993) have also accepted Hydrastidaceae as a distinct family. Tobe in Kubitzki & Bayer places Hydrastis with the Asian *Glaucidium* in a bigeneric Hydrastidaceae. But Angiosperm Phylogeny Group (2003) and Stevens (2008) treat *Hydrastis* and *Glaucidium* as the basalmost group in a broadly circumscribed Ranunculaceae. Recognition of Hydrastidaceae as separate from Ranunculaceae would tend to be favored by criteria 1, 2, 5, and 6, and opposed by criteria 3 and 4 (a small group, not usually recognized in the past). This one seems likely to remain controversial and variable!

Platanus (Platanaceae) and Proteaceae

Molecular and morphological evidence has accumulated that make clear that Platanaceae, the Sycamore or Plane-tree Family (consisting only of the genus *Platanus*, with 7 species) is most closely related (sister) to Proteaceae, a large family of trees and shrubs (ca. 80 genera and ca. 1770 species). The suggestion that *Platanus* should be included in Proteaceae (Angiosperm Phylogeny Group 2003) has generally not been followed, as only criteria 3 and 5 would tend to favor the "lumping."

Osmundastrum and *Osmunda*

Osmundastrum!? A recent study of Osmundaceae (Metzgar et al. 2008) shows a very robust phylogenetic tree (shown on the next page) that correlates with other morphological and molecular studies. In this tree, our familiar *Osmunda cinnamomea* (cinnamon fern) is basal in the family, above that is a dichotomy that separates a clade with other traditional *Osmunda* species, including *O. claytoniana* (interrupted fern) and *O. regalis* (royal fern), and a clade with species traditionally treated in the genera *Todea* and *Leptopteris*. Thus, in cladistic terminology, the recognition of *Todea* and *Leptopteris* as distinct from *Osmunda* would render *Osmunda* in its traditional circumscription paraphyletic. Two possible solutions suggest themselves:

1. Combine all the taxa into a single genus. But *Todea* and *Leptopteris* are morphologically very distinctive and have been traditionally recognized.
2. Separate *Osmunda cinnamomea* into a separate genus, maintaining *Todea*, *Leptopteris*, and *Osmunda* (minus *O. cinnamomea*) in their traditional circumscriptions.

Metzgar et al. (2008) argue for the second course of action, which is supported by criteria 1, 2, 4, 5, and 6.

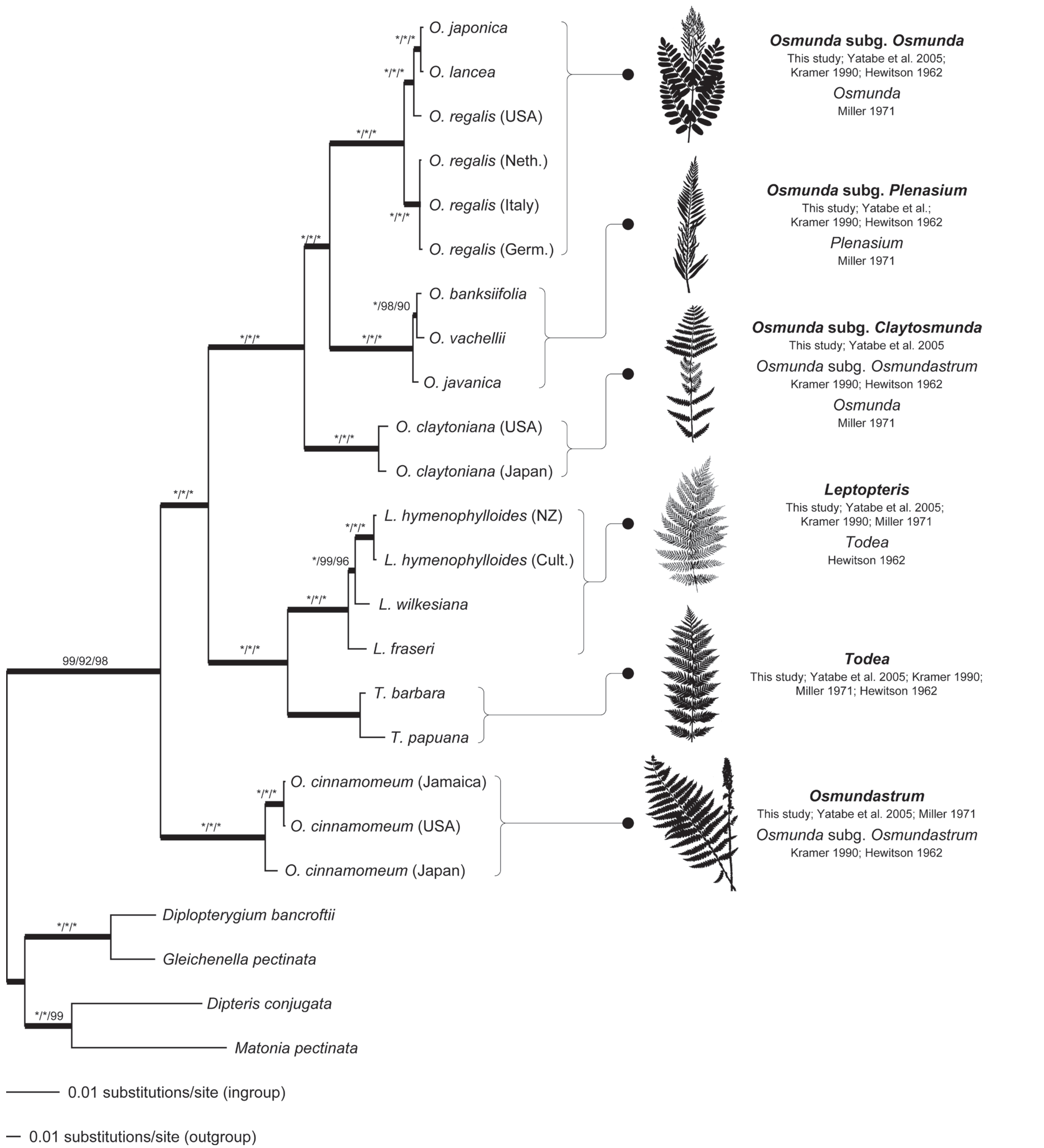

FIG. 1. 50% majority-rule consensus tree resulting from Bayesian (B/MCMC) analyses of the combined seven-locus data set, depicting the topology and average branch lengths in Osmundaceae. *Diplopterygium*, *Dipteris*, *Gleichenella*, and *Matonia* are outgroups. To increase clarity of ingroup relationships, branch lengths outside Osmundaceae (including branch leading to Osmundaceae) are shown at 0.25 scale. All divergences were well supported by all three measures (PP ≥ 0.99, MLBS ≥ 90, MPBS ≥ 90) and are shown as thickened branches with support values above each branch (PP/MLBS/MPBS; 1.00 PP and 100% BS values indicated by asterisks). Multiple accessions of the same taxon are distinguished by their geographical origin in parentheses. Silhouettes identifying a representative of each clade are modified from Hewitson (1962; *O. cinnamomeum*, *O. claytoniana*, and *O. javanica*), Hoshizaki and Moran (2001; *T. barbara* and *L. hymenophylloides*), and Berry et al. (1995; *O. regalis*). Our taxonomic recommendations are in bold type alongside the silhouettes, above those favored by previous authors.

Figure reproduced with permission of the senior author (Metzgar) and the publisher (Systematic Botany)

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Rare Plants

by Linda Chafin

Nailwort

Nailwort is one of the common names given to plants in the genus *Paronychia* (Greek, *para* = near + *onyx* = nail). Apparently, an ancient herbalist thought these plants cured infections of the fingernails and toenails—"whitlows"—hence the common names for this genus, whitlow-wort and nailwort, as well as the scientific. Entering *Paronychia* into your computer's search engine will yield way more information than you ever wanted to know about these infections—and surprisingly little about the biology of this interesting group of plants.

Paronychia belongs to Caryophyllaceae, the pink family, famous for its colorful flowers with their "pinked" and fringed petals. Apparently, the nailworts did not get the dress code memo, turning up without petals of any kind or color, bearing only small, often dully colored sepals, usually tipped with spiny awns. Perhaps these tiny, claw-like tips inspired our ancient herbalist who, employing the doctrine of signatures to look for clues to a plant's usefulness in its morphology, used these plants to treat nail infections.

About 110 species of *Paronychia* are found worldwide, mostly in the temperate regions of North and South America, Eurasia, and Africa. "The Flora of North America" describes 32 lower taxa on our continent; NatureServe lists 44. Many of these taxa have narrow ranges, in some cases being endemic to one or two states. Others are more widely distributed but are represented by scattered, disjunct populations. Of the 16 taxa that Weakley lists for his treatment area (VA, NC, SC, GA, north Florida), all are inhabitants of dry, stressful habitats such as sandhills, scrub, dunes, shale barrens, and rock outcrops. Several grow in conditions that stunt or kill all but an exclusive suite of highly adapted species.

Virginia nailwort (*Paronychia virginica*) belongs to this latter group of specialists. It is broadly distributed throughout the mid- and eastern United States: Missouri, Arkansas, Oklahoma, Texas, West Virginia, Maryland, North Carolina, Georgia, and Alabama. But it is common nowhere in this range and, in several states, is critically imperiled. In eastern states, it is found on dry, exposed shale barrens and in droughty, high-magnesium soils formed over dolomite and serpentine. Farther west, in Missouri it occurs on limestone glades and, in Oklahoma and Arkansas, it is associated with sandstone outcrops and shale bluffs where it roots in bare bedrock.

At most sites where it occurs in the east, Virginia nailwort is associated with a high number of rare and endemic species. On shale barrens in Virginia, West Virginia, and Maryland, it occurs with numerous shale barren endemics such as Kate's mountain clover (*Trifolium virginicum*) and shale barren rockcress (*Arabis serotina*). In Alabama, it grows with dozens of rare or endemic plants on Ketona dolomite outcrops. In Georgia, it is found on a serpentine ridge with pineland Barbara's buttons (*Marshallia ramosa*) and a newly described species and narrow endemic, Dixie Mountain breadroot (*Pediomelum piedmontanum*).

Virginia nailwort is a perennial herb, its sprawling stems branching from the top of a woody crown and reaching up to 45 cm in length. It's leaves are leathery, needlelike, and evergreen, up to 3 cm long. The leaves are opposite and joined by a pair of leaf-like, deeply cleft stipules. The flowers have five yellow, papery sepals, less than 3 mm long; each sepal has a narrow, white margin and is tipped with a spiny awn. The flowers, when massed into cymes at the tips of branches, are quite showy. Virginia nailwort, with its fine, blue-green leaves and clusters of yellow flowers, growing among lichen-splotched stones, is a beautiful "rock garden" plant. It is also one of the toughest native plants around, rivaling cactus in its drought-resistance and thriving in soils with near toxic levels of magnesium.

The search engines and botanical literature are silent when it comes to Virginia nailwort's pollinators, breeding system, means of seed dispersal, and other aspects of life history. Are plants self-fertile or do they require pollinators to transfer pollen? The masses of yellow flowers probably attract bees but it is unknown if the flowers produce nectar. Do the plants bear both chasmogamous and cleistogamous flowers? The authors of the "Flora of North America" treatment state that "...the vast majority [of flowers] seen on *Paronychia* specimens... are closed," but could this be an artifact of pressing? The flowers I've seen on a Georgia serpentine ridge are completely open. The fruit—an indehiscent utricle less than 2 mm (1/16 inch) long—is one-seeded and somewhat inflated. The seeds lack obvious means of dispersal, such as wings and elaiosomes. Perhaps the spiny-tipped sepals remain attached to the mature fruits and cling to fur and feathers? How viable are the seeds? What are their germination requirements? Combining these life history questions with quantification of its habitat requirements would make Virginia nailwort a great candidate for a graduate thesis, and shed light on the survival strategies of this rugged species and on the environmental attributes of some of the most important rare plant habitats in the eastern U.S.

Allison, J.R., M.W. Morris, and A.N. Egan. 2006. A new species of *Pediomelum* (Fabaceae) from the lower Piedmont plateau of Georgia and South Carolina. Sida 22(1): 227-241.

Allison, J.R. and T.E. Stevens. 2001. Vascular flora of Ketona dolomite outcrops in Bibb County, Alabama. Castanea 66(1/2): 154-205.

Fleming, G.P., P.P. Coulling, K.D. Patterson, and K. Taverna. 2006. The natural communities of Virginia: Version 2.2. Virginia Department of Conservation and Recreation, Division of Natural Heritage, Richmond, VA. <http://www.dcr.virginia.gov/natural_heritage/ncintro.shtml.>

FNA. 2005. Flora of North America. Vol. 5, Magnoliophyta: Caryophyllidae, part 2: Caryophyllaceae, Plumbaginaceae, and Polygonaceae. http://www.efloras.org/florataxon.aspx?flora_id=1&taxon_id=124085

Harrison, J.W. Classification of Vegetative Communities of Maryland: First Iteration. Maryland Department of Natural Resources, Natural Heritage Program, Annapolis. http://www.dnr.state.md.us/wildlife/shale_barrens.asp

Weakley, A.S. 2008. Flora of the Carolinas, Virginia, Georgia, northern Florida, and surrounding areas. University of North Carolina, Chapel Hill. http://www.herbarium.unc.edu/flora.htm.

Mystery Plants

by Dan Pittillo

Both small trees should be familiar to everyone in the East but sometimes confused due to the venation patterns. No. 1 is beginning to take on its fall color while No. 2 is yet to turn colors. Although the fruit types of the two are the same, the inflorescence of No. 1 does not have developed pedicels while No. 2 has well developed ones.

In the past issues (V. 16 1&2), Kevin Caldwell, Tracy Roof, Greg Schmidt, Susan Sweetser, and Stephan Zuno identified *Polystichum acrostichoides*, *Diplazium pycnocarpon*, *Verbesina occidentalis* and *Ageratina altissima* correctly and David Emory and Jim Rentch got the two ferns correctly named. These two should be fairly easy so I anticipate more will get these correct. Photos are by Dan Pittillo.

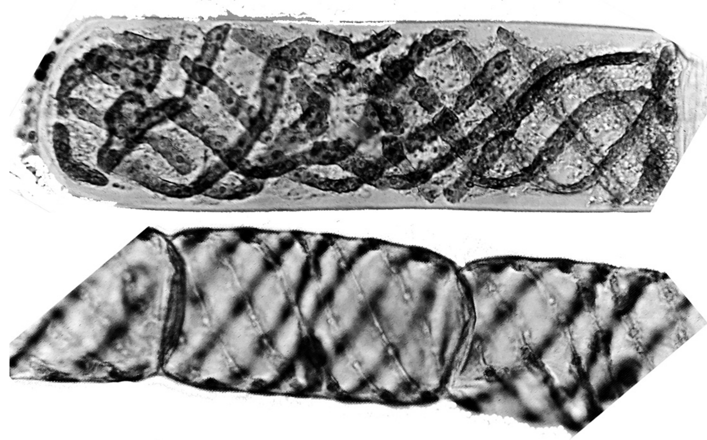
E-mail your answers to: dpittillo@gmail.com or write to 675 Cane Creek Road, Sylva, NC 28779 by Nov. 30. Good luck!

A New Technique, continued from page 2

apart. So prepared, the tray will accommodate 292 tubes. With four trays stacked in each of the 26 compartments in the case, 30,576 tubes can be stored.

When a specialist annotates stored collections, he or she will be able to verify or correct the number and identity of the species determined in the initial identification. Again, a sample of the collection is removed from the tube to a slide, covered with 20% calcium chloride and a cover glass, and observed with bright-field optics. The slide label should bear the collection number. A day after such a preparation is made, the fluid under the cover glass will retract pulling air under the margin of the cover glass. For that day and the next, additional calcium chloride should be pipetted at the edge of the cover glass to fill the space. From that time on, retraction will cease, and the slide preparation is permanent as long as the slide is stored flat in another specialized tray . And these slide should be stored because they document the annotation data which should be added to the file for that collection.

Trays for the slides should be constructed from a 3 inch plywood board in size 162 x 123 inches. Side guard strips of wood 2 inch wide and : inch high are attached by glue or nails to the right and left long margins of the board. Three horizontal rows of 14 slides each and two vertical rows of 5 slides each can be stored in the tray between the side guards separated from one another with push pins or small nails inserted firmly into the floor of the tray as shown in the figure below.



Each tray will hold 62 slides, and with five trays in each compartment (310 slides), a herbarium cabinet will hold 8, 060 slides.

The identity of large specimens of marine algae of thalloid form, e.g., *Ulva*, *Laminaria*, etc., is well preserved in traditionally prepared herbarium specimens, but that identity is lost in pressed specimens of fresh water, filamentous, colonial, and unicellular algae. Keeping these algae in a calcium chloride solution as here described offers an adequate alternative.

Taxonomic Advisory! continued from page 5

Panax trifolius and the rest of *Panax*

Phylogenetic analyses have shown *Panax* to be monophyletic, with the basal species *Panax trifolius* (dwarf ginseng) (Choi & Wen 2000, Wen et al. 2001). Put another way, *P. trifolius* is sister to the rest of the genus. This is not surprising, given its many morphological distinctions:

"*Panax trifolius* from eastern North America is sister to the clade consisting of the remaining species in the genus. This species is morphologically and palynologically unique as well… Such striate tecta and very large columellae are unknown in the pollen of any other members of Araliaceae examined. Grains of *P. trifolius* are the largest of the species in *Panax*. Morphologically, *P. trifolius* is distinct from other *Panax* species: globose main roots, diphasious reproductive system (sex-changing) white petals, 3-locular ovary, and dry fruits. In spite of the many unique characters of *P. trifolius*, broader phylogenetic analyses of Araliaceae still support the monophyly of *Panax*." (Choi & Wen 2000)

Criteria 1, 2, 5, and 6 could be invoked to suggest that *Panax trifolius* should be treated as a monotypic genus, but criteria 3 and 4 push back the other way, and no-one (so far) has proposed erecting a new genus for *P. trifolius*.

Clearly, cases of this kind are likely to remain controversial and unsettled, as "the rules" for taxonomic decision-making (lumping and splitting, and appropriate rank) are not clear, and one woman's genus will continue to be another woman's "well-marked subgenus."

References:

Angiosperm Phylogeny Group. 2003. An update of the Angiosperm Phylogeny Group classification for the orders and families of flowering plants: APG II. Bot. J. Linn. Soc. 141: 399-436.

Choi, H.-K., and J. Wen. 2000. A phylogenetic analysis of *Panax* (Araliaceae): integrating cpDNA restriction site and nuclear rDNA ITS sequence data. Plant Syst. Evol. 224: 109-120.

Judd, W.S., C.C. Campbell, E.A. Kellogg, P.F. Stevens, and M.J. Donoghue. 2008. Plant systematics: a phylogenetic approach. Third edition. Sinauer and Assoc.. Sunderland, Mass.

Metzgar, J.S., J.E. Skog, E.A. Zimmer, and K.M. Pryer. 2008. The paraphyly of *Osmunda* is confirmed by phylogenetic analyses of seven plastid loci. Systematic Bot. 33: 31-36.

Reveal, J.L. 1993. A splitter's guide to the higher taxa of the flowering plants (Magnoliophyta) generally arranged to follow the sequence proposed by Thorne (1992) with certain modifications. Phytologia 74: 203-263.

Stevens, P.F. 2008. Angiosperm Phylogeny Website. Version 9, June 2008 [and more or less continuously updated since].

Thorne, R.F. 1992. Classification and geography of the flowering plants. Bot. Review 58: 225-348.

Tobe, H., and R.C. Keating. 1985. The morphology and anatomy of *Hydrastis* (Ranunculales): systematic reevaluation of the genus. Bot Mag. Tokyo 98: 291-316.

Wen, J., G.M. Plunkett, A.D. Mitchell, and S.J. Wagstaff. 2001. The evolution of Araliaceae: a phylogenetic analysis based on ITS sequences of nuclear ribosomal DNA. Systematic Botany 26: 144-167

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