




American Journal of  
**Botany**

Celebrating 100 years  1914–2014

March 2014 • Volume 101 • Number 3

Official Publication of the Botanical Society of America, Inc.  
[www.amjbot.org](http://www.amjbot.org)

**Cover Illustration:** Digital reconstruction of the centipede clubmoss, *Leclercqia scolopendra* sp. nov. (Protolpidodendraceae: Lycopsidea) from the Middle Devonian Chilliwack flora of Washington state. Displaying a remarkable degree of morphological conservatism for over 400 million years, homosporous lycopsids provide a unique system for interpreting trends in early vascular plant form. In Benca et al.—Applying morphometrics to early land plant systematics: A new *Leclercqia* (Lycopsidea) species from Washington State, USA, pp. 510–520 in this issue, the new Devonian lycopsid *Leclercqia scolopendra* was distinguished from pre-existing members of the genus through parallel morphometric analyses of extant and extinct taxa. In particular, variation in vegetative morphology within and between living *Lycopodium* and *Spinulum* (a segregate of *Lycopodium* sensu lato) was used to assess the systematic importance of previously overlooked fossil leaf traits in *Leclercqia*. These traits expand the range of diagnostic features in fragmentary *Leclercqia* axes, increasing taxonomic precision and relevance of disarticulated Devonian material. Applied to this nearly pan-global genus, morphometric analyses showed promise as a powerful, nondestructive approach for evaluating degrees of variation in widely distributed early land plants. Vectored illustration: Jeff Benca.

# American Journal of Botany

Celebrating 100 years 1914–2014

March 2014 · Volume 101 · Number 3

## TABLE OF CONTENTS

### AJB Centennial Review

The voice of American botanists: The founding and establishment of the *American Journal of Botany*, “American Botany,” and the Great War (1906–1935)

VASSILIKI BETTY SMOCOVITIS

389

### Anatomy and Morphology

Exploring bud dormancy completion with a combined architectural and phenological analysis: The case of apple trees in contrasting winter temperature conditions

JULIANO DUTRA SCHMITZ, YANN GUÉDON, FLAVIO GILBERTO HERTER, GABRIEL BERENHAUSER LEITE, AND PIERRE-ÉRIC LAURI

398

### Developmental Biology and Developmental Genetics

Phenotypic characterization of the *CRISPA* (*ARP* gene) mutant of pea (*Pisum sativum*; Fabaceae): A reevaluation

DARLEEN A. DEMASON AND VENKATESWARI CHETTY

408

### Ecology

Can floral display size compensate for Allee effects caused by low population abundance and density in *Synthyris bullii* (Plantaginaceae), a rare species?

KATHERINE CHI AND BRENDA MOLANO-FLORES

428

Leaf traits and herbivory levels in a tropical gymnosperm, *Zamia stevensonii* (Zamiaceae)

ALBERTO PRADO, ADRIEL SIERRA, DONALD WINDSOR, AND JACQUELINE C. BEDE

437

Phenotypic plasticity of invasive *Spartina densiflora* (Poaceae) along a broad latitudinal gradient on the Pacific Coast of North America

JESÚS M. CASTILLO, BRENDA J. GREWELL, ANDREA PICKART, ALEJANDRO BORTOLUS, CARLOS PEÑA, ENRIQUE FIGUEROA, AND MARK SYTSA

448

Sexual reproduction of Japanese knotweed (*Fallopia japonica* s.l.) at its northern distribution limit: New evidence of the effect of climate warming on an invasive species

ELISABETH GROENEVELD, FRANÇOIS BELZILE, AND CLAUDE LAVOIE

459

Tree genotype and genetically based growth traits structure twig endophyte communities

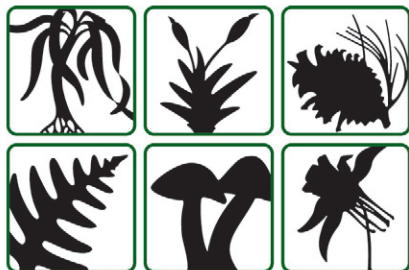
LOUIS J. LAMIT, MATTHEW K. LAU, CHRISTOPHER M. STULTZ, STUART C. WOOLEY, THOMAS G. WHITHAM, AND CATHERINE A. GEHRING

467

Suppression of native *Melaleuca ericifolia* by the invasive *Phragmites australis* through allelopathic root exudates

MD. NAZIM UDDIN, RANDALL WILLIAM ROBINSON, DOMENIC CARIDI, AND MD. ABDULLAH YOUSUF AL HARUN

479



**BOTANICAL SOCIETY OF AMERICA**  
leading scientists and educators  
since 1893

# TABLE OF CONTENTS CONTINUED

Population differentiation for germination and early seedling root growth traits under saline conditions in the annual legume *Medicago truncatula* (Fabaceae)  
MATILDE A. CORDEIRO, KEN S. MORIUCHI, TONYA D. FOTINOS, KELSEY E. MILLER,  
SERGEY V. NUZHON, ERIC J. VON WETTBERG, AND DOUGLAS R. COOK 488

## Evolution and Phylogeny

*Gisekia* (Gisekiaceae): Phylogenetic relationships, biogeography, and ecophysiology of a poorly known C<sub>4</sub> lineage in the Caryophyllales  
KERSTIN BISSINGER, ROXANNE KHOSHRAVESH, JAN PETER KOTRADE, JASON OAKLEY,  
TAMMY L. SAGE, ROWAN F. SAGE, HEIDRUN E. K. HARTMANN, AND GUDRUN KADEREIT 499

## Paleobotany

Applying morphometrics to early land plant systematics: A new *Leclercqia* (Lycopsida) species from Washington State, USA  
JEFFREY P. BENCA, MAUREEN H. CARLISLE, SILAS BERGEN,  
AND CAROLINE A. E. STRÖMBERG 510

## Population Biology

Understanding population structure and historical demography in a conservation context: Population genetics of the endangered *Kirengeshoma palmata* (Hydrangeaceae)  
NA YUAN, YI SUN, HANS-PETER COMES, CHENG-XIN FU, AND YING-XIONG QIU 521

## Reproductive Biology

How common is self-incompatibility across species of the herkogamous genus *Ariocarpus*?  
CONCEPCIÓN MARTÍNEZ-PERALTA, JUDITH MÁRQUEZ-GUZMÁN,  
AND MARÍA C. MANDUJANO 530

## Systematics and Phylogeography

Morphological, phylogenetic, and ecological diversity of the new model species *Setaria viridis* (Poaceae: Paniceae) and its close relatives  
DANIEL J. LAYTON AND ELIZABETH A. KELLOGG 539

## Abbreviations

**Miscellaneous:** AFLP, amplified fragment length polymorphisms; a.s.l., above sea level; bp, base pair; BP, before present; BSA, bovine serum albumin; cpDNA, chloroplast DNA; CTAB, hexadecyltrimethylammonium bromide; cv., cultivar; ddH<sub>2</sub>O, double-distilled water; dNTP, deoxyribonucleotide E.C., Enzyme Commission; EDTA, ethylene diamine tetra-acetic acid; f. sp., forma specialis; indels, insertions and deletions; ITS, internal transcribed spacer; LM, light microscopy; mya, million years ago; PAGE, polyacrylamide gel electrophoresis; PCR, polymerase chain reaction; RAPD, random amplified polymorphic dimorphism; SDS, sodium dodecyl sulfate; SEM, scanning electron microscopy; s.l., sensu lato; s.s., sensu stricto; subsp., subspecies; TEM, transmission electron microscopy

**Genetics:** *A*, mean number of alleles per locus; *D*, mean genetic distance; CI, consistency index; *F*, fixation index; *F*<sub>IT</sub>, total deviation from Hardy-Weinberg expectations; *F*<sub>ST</sub>, genetic diversity among populations; *F*<sub>IS</sub>, inbreeding within populations; *G*<sub>ST</sub>, the proportion of genetic diversity among populations; *H*<sub>e</sub>, Hardy-Weinberg expected heterozygosity; *H*<sub>o</sub>, observed heterozygosity; MP, most parsimonious tree; *n*, individual chromosome number; *N*<sub>m</sub>, mean number of migrants per generation; *P*<sub>p</sub>, percentage of polymorphic loci; RI, retention index; *x*, base chromosome number

**Statistics and math:** ANOVA, analysis of variance; CV, coefficient of variation; df, degrees of freedom; *N*, number of individuals; *p*, probability; *P*, level of significance; PCA, principal components analysis; *r*, coefficient of correlation; SE, standard error; SD, standard deviation