

Peter W. Schafran

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Education

Ph.D. candidate, Ecological Sciences; Old Dominion University, Norfolk, VA. In progress.

M.S., Biology; Old Dominion University, Norfolk, VA, 2014.

B.S. with honors, Biology; Old Dominion University, Norfolk, VA, 2010

Research Interests

Systematics of *Isoetes*. Morphological, cytological, and molecular analyses are employed to understand the evolutionary and biogeographical history of this genus.

Molecular identification of sub-populations of Longleaf Pine (*Pinus palustris*)

Ecology and cultivation of rare native Virginian plants, especially associates of the Longleaf Pine ecosystem.

Relevant Work Experience

October 2017 – April 2018: Predoctoral fellow, Smithsonian Institution National Museum of Natural History

July 2015 – present: Research associate, Smithsonian Institution National Museum of Natural History.

October 2012 - present: Consultant for Wildlands Engineering Inc. Identification of wetland plants at the Malbone mitigation site, West Neck Creek, Virginia Beach, VA.

May – July 2015: 10-week GRAD fellow, Smithsonian Institution National Museum of Natural History.

August – December 2014: Graduate teaching assistant, Old Dominion University. Taught BIOL 111 (Environmental Science) lab sections under Dr. Tatyana Lobova.

August 2014: Teaching assistant for Wetland Plants course, Cranberry Lake Biological Station, State University of New York – College of Environmental Science and Forestry.

May – June 2014: Instructor of BIOL 340: Field Botany, Old Dominion University.

January – May 2014: Graduate teaching assistant, Old Dominion University. Taught BIOL 308 (Botany) lab sections under Dr. Kneeland Nesius.

August 2013 – December 2013: Graduate teaching assistant, Old Dominion University. Taught BIOL 115 (General Biology) lab sections under Dr. Doug Mills.

August 2013: Teaching assistant for Adirondack Flora course, Cranberry Lake Biological Station, State University of New York – College of Environmental Science and Forestry.

April – June 2013: Visiting professor, American University of Iraq-Sulaimani. Instructor for BOT 232 “Botany and the Environment” and BOT 233 “Introduction to Plant Identification”.

August 2012: Teaching assistant for Adirondack Flora course, Cranberry Lake Biological Station, State University of New York – College of Environmental Science and Forestry.

May 2012 - June 2012: Visiting lecturer, American University of Iraq-Sulaimani. I assisted in teaching a 3 week course on plant taxonomy and plant identification in Iraqi-Kurdistan.

August 2011 – May 2013: Graduate research assistant, Old Dominion University, under Dr. Lytton Musselman. Continuation of all jobs as an hourly student worker (see below), plus assisting with laboratory work when needed, and overseeing undergraduate workers.

July 2010 - July 2011: Was an hourly student worker under Dr. Musselman. Duties included collection of plant materials related to projects on native edible plants and cordial flavorings, proofreading and editing manuscripts on plants of the Bible and plants of the Chesapeake Bay, updating the ODU Plant website and related webpages, and acting as caretaker of ODU’s *Isoetes* collection.

June - August 2008: Worked as a research assistant in the Environmental Engineering Laboratory at Old Dominion University. Responsible for all aspects of conducting coagulation, MIEX treatment, and manganese oxidation studies on water collected from Sandy River Reservoir, VA. The effort included field sampling, the set up and running of coagulation jar tests evaluating turbidity, DOC, and UV-254 removal and jar tests examining the effect of MIEX treatment on DOC removal and subsequent coagulation. Conducted Mn-oxidation studies with KMnO_4 and operated an ultrafiltration cell for separation and atomic absorption spectroscopy for Mn analysis. Examined the

temperature effect on both Mn oxidation and MIEX treatment. Tabulated and graphed all results and assisted in writing the final report.

June - August 2005: Worked as a research assistant in the Environmental Engineering Laboratory at Old Dominion University. Conducted sediment sampling and set up and ran an experiment to evaluate the effect of enhanced aeration on the decomposition of sediments in a Virginia Beach lake. Conducted field sampling of Sandy River Reservoir (Prince Edward County) to evaluate spatial and temporal variations in water quality.

August 2004 – 2009: Worked as needed for Environmental and Economic Consultants, Inc. analyzing water samples for turbidity, pH, and UV/Visible light absorbance. Was also responsible for organizing and graphing the data to illustrate the effects of various treatment conditions on the removal of turbidity and light-absorbing organic compounds from industrial wastewaters.

July - August 2004: Worked as a research assistant in the Environmental Engineering Laboratory at Old Dominion University. Outlined and determined the area of sub-watersheds in the Sandy River Reservoir watershed (Prince Edward County, VA) and calculated the annual average runoff from each area. Calculated the depth dependent volume of the reservoir using a reservoir bathymetry map and estimated average travel time of water through the reservoir. Developed graphs and tables based on these analyses.

June - August 2003: Worked as a research assistant in the Environmental Engineering Laboratory at Old Dominion University; Conducted water quality analyses to evaluate cation and anion exchange resins supporting the design of the New River Water Treatment Plant (North Carolina). Was responsible for the analysis of hardness, pH, conductivity, and turbidity including instrument calibration and quality control and quality assurance measures. Entered data spreadsheets and prepared graphs to illustrate treatment performance of the resins tested.

Publications

- Schafran, P.W., Zimmer, E.A., Taylor, W.C., and L.J. Musselman. 2018. A whole chloroplast genome phylogeny of the diploid species of *Isoetes* (Isoëtaceae, Lycopodiophyta) in the southeastern United States. *Castanea* 83(2): 224-235.
- Bray, R.D., Schafran, P.W. and L.J. Musselman. 2018. Interesting, provocative, and enigmatic: morphological observations on southeastern quillworts (*Isoetes*, Isoetaceae, Lycopodiophyta). *Castanea* 83(2): 263-269.
- Schafran, P.W., Johnson, G., Taylor, W.C., Zimmer, E.A., and L.J. Musselman. 2018. Low-copy nuclear markers in *Isoetes* L. (Isoëtaceae, Lycopodiophyta) identified with transcriptomes. *Applications in Plant Sciences* 6(4): e1142.
- Bolin, J.F., Hartwig, C.L., Schafran P.W., and Komarnytsky, S. 2018. Application of DNA flow cytometry to aid species delimitation in *Isoetes*. *Castanea* 83(1): 38-47.
- Schafran, P.W., Leonard, S.W., Bray, R.D., Taylor, W.C., and Musselman, L.J. 2016. *Isoetes mississippiensis*: a new quillwort from Mississippi, USA. *Phytokeys* 74: 97-106.
- Schafran, P.W. 2014. The ethnobotany of *Pistacia eurycarpa* Yalt. in Iraqi-Kurdistan: its uses, chemical composition, and anti-biotic activity of its resin. M.S. thesis. Old Dominion University.

Invited Presentations

Unrecognized genetic diversity in polyploid *Isoetes* revealed with PacBio DNA sequencing

P.W. Schafran, E.A. Zimmer, W.C. Taylor, J.F. Bolin, and L.J. Musselman
Botanical Society of America Meeting, July 2018, Rochester, MN

Allopolyploid and autopolyploid speciation revealed through whole plastomes and nuclear homologues in northwestern North American *Isoetes* (Quillworts)

J. Suissa, W.C. Taylor, **P.W. Schafran**, and E.A. Zimmer

Botanical Society of America Meeting, July 2018, Rochester, MN

Revealing phylogenetic relationships in northeastern North American *Isoetes*

W.C. Taylor, **P.W. Schafran**, L.J. Musselman, J.F. Bolin, and E.A. Zimmer

Botanical Society of America Meeting, July 2018, Rochester, MN

Towards a phylogeny of *Isoetes* in the Southeastern United States

P.W. Schafran, E.A. Zimmer, W.C. Taylor, and L.J. Musselman

Association of Southeastern Biologists Meeting, April 2016, Concord, NC

Selected Presentations and Programs

Schafran, P.W., Zimmer, E.A., Taylor, W.C. and Musselman, L.J. 2018. The *Isoetes flaccida* complex in the southeastern United States: unrecognized species diversity in southern Georgia and northern Florida. Smithsonian Botanical Symposium. Washington, DC.

Schafran, P.W., Zimmer, E.A., Taylor, W.C. and Musselman, L.J. 2018. Unexpected genetic diversity in polyploid *Isoetes* revealed with PacBio DNA sequencing. Association of Southeastern Biologists meeting. Myrtle Beach, SC.

Schafran, P.W., Zimmer, E.A., Taylor, W.C. and Musselman, L.J. 2018. The *Isoetes flaccida* complex in the southeastern United States: unrecognized species diversity in southern Georgia and northern Florida. Association of Southeastern Biologists meeting. Myrtle Beach, SC.

Flanders, N., **Schafran, P.**, Amos, I., Kolgan, L., Waag, D., and Musselman, L. 2018. Relationships between tree density and the growth and survival of Longleaf Pine (*Pinus palustris*) at Blackwater Ecologic Preserve in Isle of Wight Co., VA. Association of Southeastern Biologists meeting. Myrtle Beach, SC.

Noyola-Alonso, K., Mandujano, V., **Schafran, P.**, Hartwig, C., Komarnytsky, S., and Bolin, J. 2018. New genome size estimates for quillworts (*Isoetes*) and their application in species delimitation. Association of Southeastern Biologists meeting. Myrtle Beach, SC.

Zimmer, E., **Schafran, P.**, Musselman, L., Johnson, G., and Taylor, W.C. 2017. *Isoetes* diversity in eastern North America. XIX International Botanical Congress. Shenzhen, China.

Amos, I., **Schafran, P.**, Flanders, N., Dotterer, T., Parks, E., and Musselman, L. 2017. Blackwater Ecological Preserve: Longleaf Pine Inventory. Association of Southeastern Biologists meeting. Montgomery, AL.

Restoration and maintenance of the Northernmost Longleaf Pine Community, Blackwater Ecological Preserve, Isle of Wight Co., VA. **Schafran, P.**, Dotterer, T., Flanders, N., Loomis, D., and Musselman, L. Poster presentation by Schafran. 2016 Biennial Longleaf Conference. 1 November 2016.

Investigating polyploidy in *Isoetes graniticus* using megaspore morphology and DNA analysis. Wu, K.Y., **Schafran, P.W.**, Johnson, G.P., Taylor, W.C., and Zimmer, E.A.

Poster presentation by Wu. Smithsonian Institution Natural History Research Experiences poster session. 4 August 2016.

Molecular phylogeny of diploid *Isoetes* (Isoetaceae, Lycophyta) in the southeastern United States based on low-copy nuclear markers and whole chloroplast genomes.

Schafran, P.W., Zimmer, E.A., Taylor, W.C., and Musselman, L.J. Paper presentation by Schafran. Botanical Society of America Meeting, 1 August 2016.

Analysis of morphological and anatomical characteristics of stomata of *Isoetes hyemalis* D. F. Brunt. Kana Huisa, E., **Schafran, P.W.**, and Musselman, L.J. Paper presentation by Schafran. Botanical Society of America Meeting, 1 August 2016.

Effect of Food Additives on in vitro Germination of *Cypripedium acaule* (Orchidaceae). Heyd, L., **Schafran, P.**, and Jones, M. Poster presentation by Heyd. Botanical Society of America Meeting, 1 August 2016.

Effects of Day Length on *Cattleya* sp. (Orchidaceae) Seed Germination. Grocholl, J., **Schafran, P.**, and Jones, M. Paper presentation by Grocholl. Botanical Society of America Meeting, 1 August 2016.

Use of Mycorrhizal Fungi in Commercial Medium when Germinating *Cypripedium acaule* (Orchidaceae). Klimczak, K., **Schafran, P.**, and Jones, M. Paper presentation by Klimczak. Botanical Society of America Meeting, 1 August 2016.

DNA sequences identify cryptic species of Quillworts (*Isoetes* L.). Zimmer, E.A., Taylor, W.C., **Schafran, P.W.**, and Johnson, G. Paper presentation by Zimmer. Botanical Society of America Meeting, 1 August 2016.

DNA sequences identify cryptic species of Quillworts (*Isoetes* L.). Zimmer, E.A., Taylor, W.C., **Schafran, P.W.**, and Johnson, G. Paper presentation by Zimmer. Evolution Meeting, 20 June 2016.

Towards a phylogeny of *Isoetes* in the Southeastern United States. **Schafran, P.W.**, Zimmer, E.A., Taylor, W.C., and Musselman, L.J. Paper presentation by Schafran. Association of Southeastern Biologists Meeting, 2 April 2016.

DNA sequences identify cryptic species of Quillworts (*Isoetes* L.). Zimmer, E.A., Taylor, W.C., **Schafran, P.W.**, and Johnson, G. Paper presentation by Zimmer. Association of Southeastern Biologists Meeting, 2 April 2016.

Rhizomorphs, scales, and sporlings of *Isoetes*. Musselman, L.J., **Schafran, P.W.**, Bray, R.D., and Keskin, M. Paper presentation by Musselman. Association of Southeastern Biologists Meeting, 2 April 2016.

The ethnobotany of *Pistacia eurycarpa* in Iraqi-Kurdistan: its chemical composition and anti-microbial activity. **Schafran, P.W.**, Ahmad, S., and Musselman, L.J. Paper presentation by Schafran. Society of Economic Botany and Society of Ethnobiology conference, 12 May 2014.

Systematics of *Isoetes* (Isoetaceae, Lycopphyta) in the Southeastern United States. **Schafran, P.W.**, Taylor, W.C., Bray, R.D., Bolin, J.F., and Musselman, L.J. Paper presentation by Schafran. Association of Southeastern Biologists Meeting, 3 April 2014.

In vitro seed germination and development of *Calopogon pallidus* (Orchidaceae) from Virginia. **Schafran, P.**, Keenan, J., Jones, M., and Musselman, L. Poster presentation by Schafran. Association of Southeastern Biologists Meeting, 3 April 2014.

Germination and development of Hazel Dodder, *Cuscuta coryli* (Convolvulaceae). Keenan, J., **Schafran, P.**, Jones, M., Bolin, J., and Musselman, L. Paper presentation by Keenan. Association of Southeastern Biologists Meeting, 3 April 2014.

Misconceptions about Quillworts (*Isoetes*, Isoetaceae, Lycophyta). Musselman, L.J., Bray, R.D., **Schafran, P.W.**, and Taylor, W.C. Paper presentation by Musselman. Association of Southeastern Biologists Meeting, 3 April 2014.

Isoetes snowii, a new diploid quillwort from the Southeastern United States. Matthews, R.A., Musselman, L.J., Taylor, W.C., and **Schafran, P.W.** Paper presentation by Matthews. Association of Southeastern Biologists Meeting, 3 April 2014.

In vitro seed germination and development of *Calopogon pallidus* (Orchidaceae) from Virginia. **Schafran, P.**, Keenan, J., Jones, M., and Musselman, L. Paper presentation by Schafran. ODU Biology Graduate Student Organization Spring Symposium, Norfolk, VA. 8 March 2014.

Wild Food Symposium. Norfolk Botanical Garden. Norfolk, VA. 12 October 2013.

The Fifth Kingdom: an introduction to fungi. Virginia Master Naturalists Peninsula Chapter general meeting. Hampton, VA. 10 September 2013.

The ethnobotany of qazwan (*Pistacia eurycarpa*) in Iraqi-Kurdistan. **Schafran, P.**, Ahmad, S., Askari, A., and Musselman, L. Paper presentation by Schafran. Plant Life of Southwest Asia Symposium, Edinburgh, Scotland, UK. 1 July 2013.

The ethnobotany of qazwan (*Pistacia eurycarpa*) in Iraqi-Kurdistan. **Schafran, P.**, Ahmad, S., Askari, A., and Musselman, L. Paper presentation by Schafran. Botanical Society of America meeting, Columbus, Ohio. 8 July 2012

What is the true identity of Tuckahoe? **Schafran, P.**, Wiggins, H., and Musselman, L. Paper presentation by Schafran. Association of Southeastern Biologists meeting, Athens, Georgia. 6 April 2012

Awards and Support

March 2018: Washington Field Biologists' Club research award

October 2017: Predoctoral Student Fellowship, Smithsonian Institution

August 2017: Nick Savage Scholarship, Old Dominion University

May 2017: W. Hardy Eshbaugh Graduate Student Award, American Society of Plant Taxonomists

May 2016: Fred Case Grant, Native Orchid Conference

April 2016: Southern Appalachian Botanical Society – Outstanding Student Oral Presentation Award at Association of Southeastern Biologists Annual Meeting

December 2015: Kirk Student Research Award, ODU

July 2015: Howard and Vivian Marshall Scholarship, ODU

May 2015: Graduate Student Fellowship, Smithsonian Institution

August 2014: Graduate Teaching Assistantship

April 2014: Association of Southeastern Biologists Graduate Student Support Award

March 2014: 1st Place PhD. category, BGSO Spring Symposium

January 2014: Graduate Teaching Assistantship

August 2013: Graduate Teaching Assistantship

August 2012: Graduate Research Assistantship

August 2010: Graduate Research Assistantship

August 2008: ODU Faculty Emeriti Association Scholarship

August 2006: Governor's Technology Scholarship

Workshops Attended

July 2016: Molecular Evolution Workshop, Marine Biological Laboratory, Woods Hole, MA

May 2011: IUCN Red Listing Workshop, Sulaimani, Kurdistan, Iraq

Society Memberships and Positions Held

American Fern Society

American Society of Plant Taxonomists

Association of Southeastern Biologists

Biology Graduate Student Organization – Old Dominion University

May 2014 – April 2015: Vice President

Botanical Society of America

Botanical Society of America – Old Dominion University Student Chapter

May 2014 – April 2015; April 2015 – May 2016: President

September 2013 – May 2014: Treasurer

January – September 2013: Community Outreach Liaison

IUCN Species Survival Commission – Freshwater Plant Specialist Group – *Isoetes*
subgroup

Southern Appalachian Botanical Society

October 2017 – October 2018: Student Representative to the Executive
Committee

Society for Economic Botany

Society of Systematic Biologists