
THE PVZimba lab, the newest addition to Rice River Center/VCU's HAB team

Introduction

Apologies for limited typing abilities: thumb knuckle removed 29 Dec,
Recovery to 80% strength in 8-10 weeks! Week 8 shown here!



Paul V. Zimba, Research Faculty, RRC, July 2022-

Former positions:

Texas A&M University Corpus Christi -Professor and Director, Center for Coastal Studies 2009-2021

USDA/Agricultural Research Service -Senior Microbiologist 1996-2009

Univ Florida, Assistant Res Prof., Fisheries and Aquatic Sciences 1989-1996

Rad Safety Officer, PhD student, Miss St Univ (Michael J. Sullivan), salt marsh algal ecology 1985-1989

Technician, Horns Point Lab, Cambridge, MD 1984-1985

Pubs: >135, *H-index* 37, *I-10* 80

Research Areas: remote sensing/ground truthing, algal ecology, algal toxins, algal taxonomy, photophysiological stress

Euglena International Network (EIN): Driving euglenoid biotechnology for the benefit of a challenged world	2022	
Testing an Iron Oxide Nanoparticle-Based Method for Magnetic Separation of Nanoplastics and Microplastics from Water		
Diversity of cyanobacteria and associated microbial community structure within Lake Okeechobee and the St. Lucie River, Florida, USA		
Effects of climate change on metabolite accumulation in freshwater and marine cyanobacteria	2021	
Diversity of bioactive compound content across 71 genera of marine, freshwater, and terrestrial cyanobacteria		
The influence of bacteria on the growth, lipid production, and extracellular metabolite accumulation by <i>Phaeodactylum tricorutum</i> (Bacillariophyceae)		
A new boring toxin producer – <i>Perforafilum tunnelli</i> gen. & sp. nov. (Oscillatoriales, Cyanobacteria) isolated from Laguna Madre, Texas, USA		
Rhodomonas PE545 fluorescence is increased by glycerol		
<i>Iningainema tapete</i> sp. nov. (Scytonemataceae, Cyanobacteria) from greenhouses in central Florida (USA) produces two types of nodularin with biosynthetic potential for anabaenopeptin synthesis		
Hydrogen peroxide, an ecofriendly remediation method for controlling <i>Microcystis aeruginosa</i> toxic blooms	2020	
Preliminary assessment of microbial community structure of wind-tidal flats in the Laguna Madre, Texas, USA		
Controlling formation of metal ion adducts and enhancing sensitivity in liquid chromatography mass spectrometry		
Superintensive Production of Juvenile Pacific White Shrimp, <i>Penaeus vannamei</i> , in Biofloc-Dominated Systems-Limiting Factors		
Genomic identification and characterization of co-occurring Harveyi clade species following a vibriosis outbreak in Pacific white shrimp, <i>Penaeus (Litopenaeus) vannamei</i>		
Extracting impervious surface from aerial imagery using semi-automatic sampling and spectral stability		

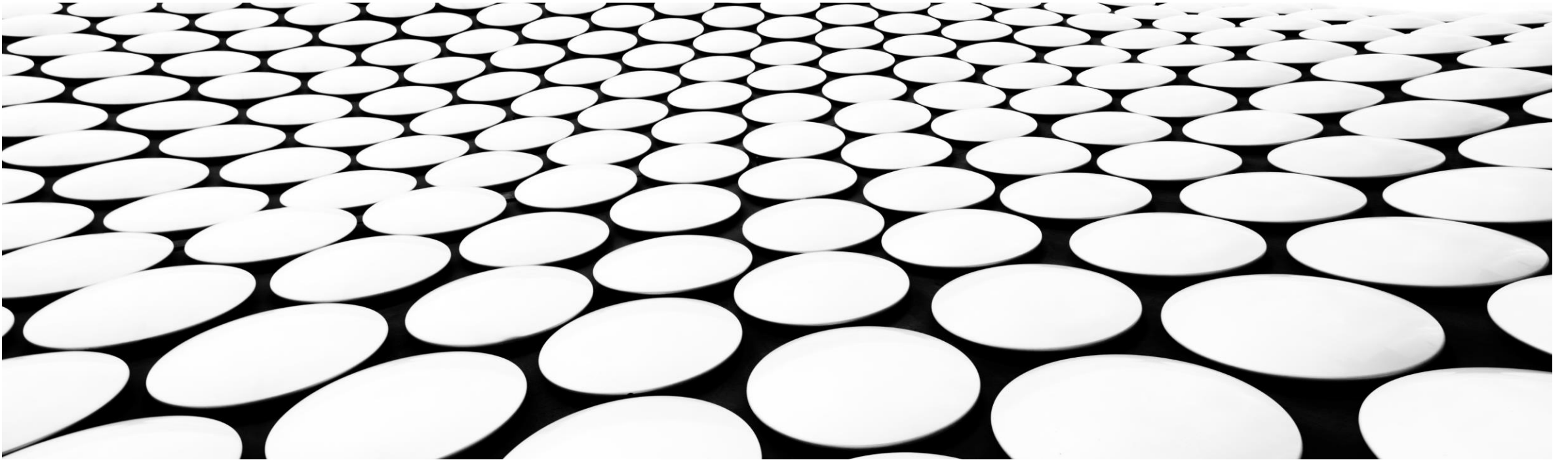


Hired as Research Faculty in June 2022 at Rice Rivers Center, Va Commonwealth University

Current work includes ultrasound control of cHABS, MSMS toxin detection, pigment stress responses, and community structure analyses using pigments

Getting my lab functional in a new university has been slow!

ALGAL BLOOM MANAGEMENT USING NON-CHEMICAL APPROACHES



Ultrasound for control of CHABS

Ecuador: reduction of biomass by 38% in 3 months (hypereutrophic to eutrophic)

Mississippi: reduction of biomass in replicated ponds by 48% in 8 weeks

Florida: replicated mesocosm study shows no trophic impact on fish survival, high diversity of bacteria!

VA: single species of algae raised in 150L mesocosms, then exposed to ultrasound. Daily photo-physiological and TEM samples collected to identify how cells impacted by exposure

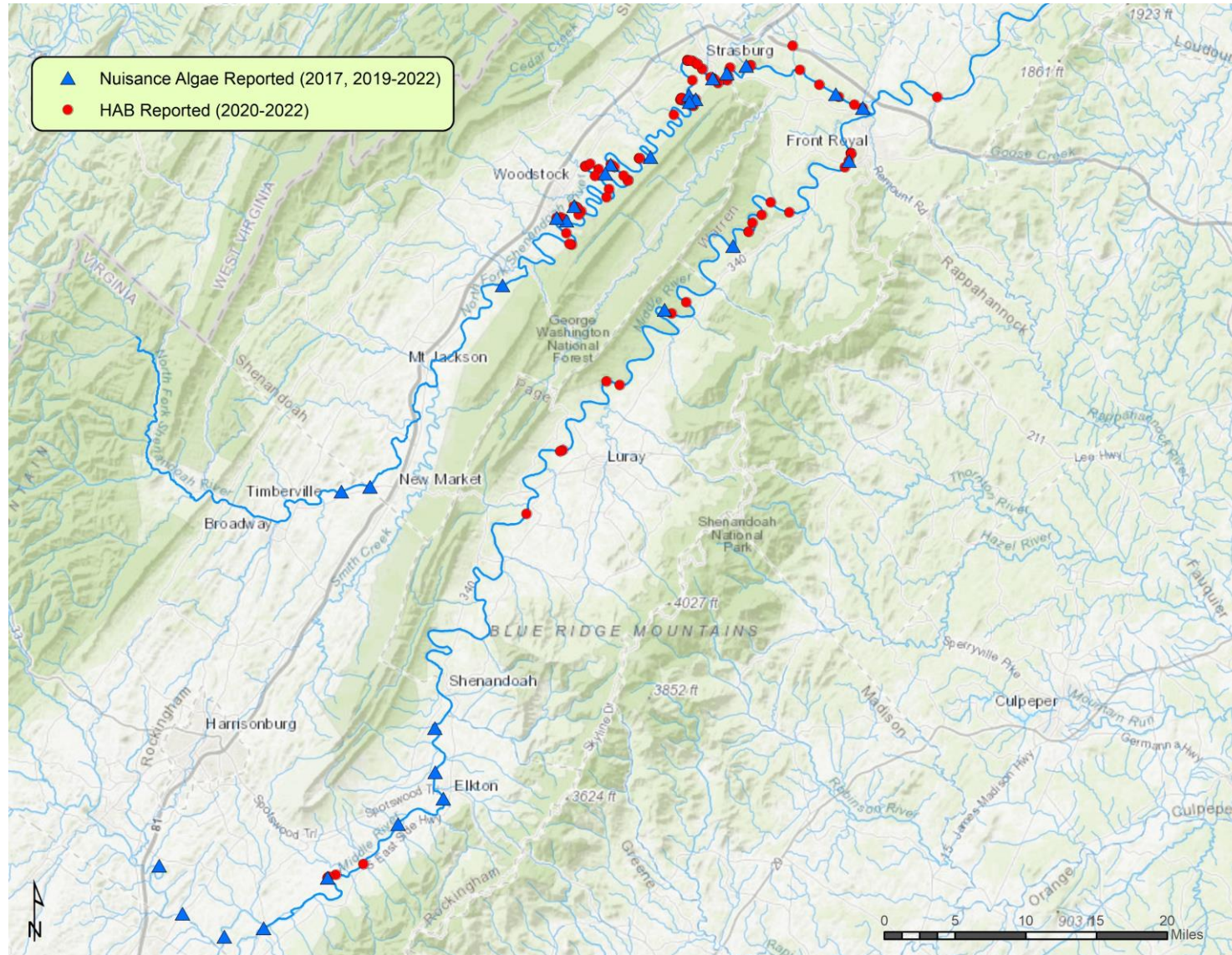
Asked to submit a full proposal to the NOAA test bed in Ft. Meyers on ultrasound in April



OCT 13 SAMPLING IN THE NORTH FORK, SHENANDOAH RIVER

DEC 29 SAMPLING

- Thanks for logistical support from the Riverkeepers Alan and Mark!
- Sampling consisted of 4 samples consisting of the dominant green algae and cyanobacteria by visual identification





Microscopy:

Spirogyra dominant attached mat-forming algae in this area of the river

Phormidium, *Oscillatoria*, and a unique filamentous taxon were the dominant epiphytes or benthic forms.

One isolate made from enrichment culturing was *Microcoleus chthonoplastes*. Non-toxic to date!

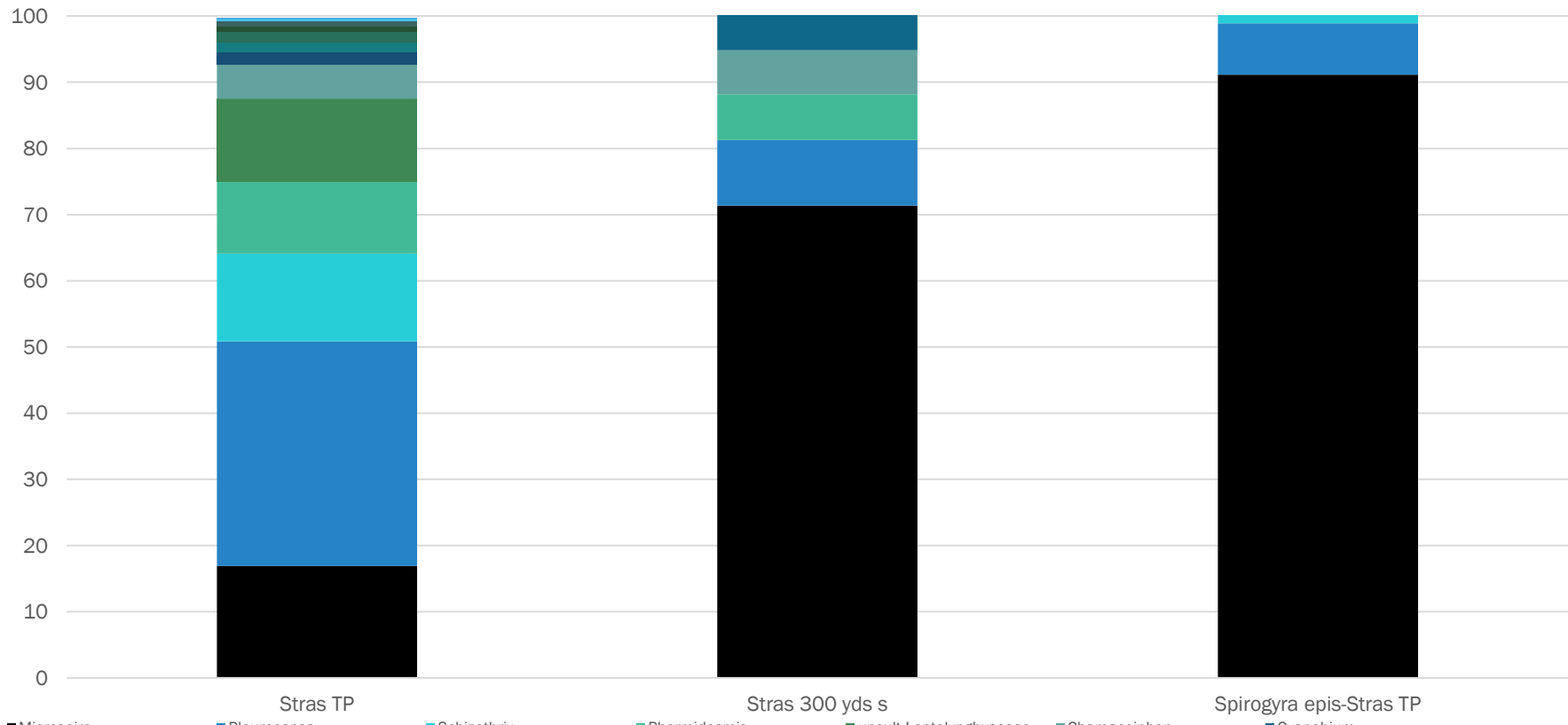
Mi-Seq analyses identified 15 unique taxonomic units, including members of the *Leptolyngbyaceae* and *Pleurocapsales*



Molecular identification:

Two benthic mat samples having high cyanobacterial abundance were processed for next generation genomic identification of taxa present. A third was from *Spirogyra* consisting of cyanobacterial epiphytes.

TU Numerical Contribution (normalized to 100%)





Algal toxins:

MSMS analyses of the four samples identified homoanatoxin as present at $>1 \mu\text{g}/\text{gr}$ wet weight in two samples

MSMS confirmed by a second lab at $2 \mu\text{g}/\text{gr}$ wet weight

No other CCL5 toxins were identified, anabaenopeptin was at $5 \mu\text{g}/\text{gr}$ wet weight



Next steps:

In discussion with USGS/ICPRB concerning how to best attack the CHAB issues in the Shenandoah River.

My suggestions included:

Use of a hyper-spectral copter to map multiple transects at <2 cm resolution to track algal biomass and partition into greens and cyanobacteria

Use of MSMS to target more than the five 5 cyanotoxins the EPA has listed. We are finding high anabaenapeptin levels in many CHAB sites worldwide

Culturing cyanobacteria to confirm toxin producers and assess nutrient tipping points for increased toxin production

Use of SPATT sampling for “between sampling toxin discharge”



Status: awaiting feedback/approval from DEQ/USGS/ICPRB

More pics next time-promise!

Acknowledgements: Dr I-Shuo Huang (Wade)

Dr. Lee Pinnell

