Joint Conference

International Conference on

Environmental Microbiology and Microbial Ecology

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International Conference on

Ecology and Ecosystems

September 18-20, 2017 Toronto, Canada

Keynote Forum

Day 1

Gregory B Gloor, J Ecosyst Ecography 2017, 7:2 (Suppl)
DOI: 10.4172/2157-7625-C1-028

Gregory B Gloor

University of Western Ontario, Canada

Cautionary tales from the microbiome: Finding what is real and reproducible

Statement of the Problem: Commonly-used methods of analyzing microbiome or RNA-seq datasets can be misleading and all the available information in a consistent manner are not in use. These results in many analyses being dominated by either the most abundant, or the rarest features: In fact, it is often the case that the most abundant taxa dominate multivariate outputs, and the rarest taxa dominate univariate outputs in the same dataset. Furthermore, these datasets have extraordinary properties that make the use of correlation and network analysis problematic.

Methodology and Theoretical Orientation: Data collected using high throughput sequencing (HTS) methods are sequence reads mapped to genomic intervals, and are commonly analyzed as either normalized count data or relative abundance data. One reason for these normalizations is to attempt to compensate for the problem that the sequencing instrument imposes an upper bound on the number of sequence reads. Positive data with an arbitrary bound are compositional data and are subject to the problem of spurious correlation. Thus, ordination, clustering and network analysis become unreliable. A second problem is that the data are sparse: i.e., contain many 0 values. A third problem is that the largest measurement error is at the low count margins in these datasets.

Conclusion & Significance: We use microbiome datasets to show how Bayesian estimation combined with compositional data approaches that examine the ratios between taxa give robust insights into the structure and function of microbial communities. I will present example datasets drawn from the human and ecological domains and show that ordination, differential abundance and correlation can be interpreted in an internally consistent manner that provides reproducible insights.

Biography

Greg Gloor is a professor of biochemistry with broad experience in molecular biology, genetics and genomics. Most recently, he has developed tools to investigate fundamentals of molecular evolution, microbial ecology and meta-transcriptomics. He is currently working on developing and adapting principled methods to characterize correlation and differential abundance in sparse, high throughput sequencing data as generated in 16S rRNA gene sequencing surveys, meta-genomics and meta-transcriptomics. He is the developer and maintainer of the ALDEx2 R package on Bioconductor.

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George Lazarovits, J Ecosyst Ecography 2017, 7:2 (Suppl)
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George Lazarovits

A&L Biologicals, Canada

A road map to finding microbiomes that most contribute to plant and soil health

The human eye does not have sufficient resolution to unravel the mysteries of soil and plant health. Corn is one of the major grains grown in Canada. The proposed maximum theoretical yield of corn is 450-500 bu/acre, but average growers are producing 150 bu/acre. The main aim of this study is to understand the factors associated with soil health and plant productivity beyond the cropping system and practices. We measure the aspects of soil physical, chemical properties and differences in microorganism communities will be related to yield responses collected from plants harvested from 40 diverse sites across Ontario using aerial infrared photography to identify sections of fields where plants appear healthy or stressed (as we discovered that when corn plants were randomly selected for testing, their microbiomes were quite similar). In this way, we hope to identify some of the primary reasons that confer the unevenness in crop yield seen across the same field when the same farm inputs had been applied. Such findings will be used to improve low production sites, thereby increasing overall yields significantly. Based on results from our previous studies we hypothesized that the difference in the plant productivity at different sites are due the abundance and diversity of microbial communities, and the impacts of their specific activities such as nitrogen fixation, phosphorous solubilisation, root growth promotion, and suppression of plant pathogens. The ratio of different soil chemical parameters affects microbial community richness and diversity in many ways. The study results will be integral in our understanding of the microbial community structures that influence crop productivity either negatively or positively. We expect to find out who are the key microorganisms and their roles in corn growth and productivity. Our initial analysis of data generated through TRFLP and next generation based sequencing of microbial communities showed, the endophytic microbial communities were distinct between low and high producing sites across most of the field sites tested. The high producing area had significantly higher bacterial richness and less diversity than the low producing area. Initial correlation analysis revealed potential positive interactions between the general fertility index, potassium to magnesium ratio, the gram negative and nitrogen fixer bacterial communities with yield and yield related parameters. Taken together, the corn sap bacterial community composition and richness was greatly influenced by soil chemical properties, which may indicate shifts in their functionality despite equal levels of total bacterial loads. The talk will identify factors associated with high and poor yielding sites and how this relates to soil and crop health.

Biography

George Lazarovits graduated with his doctorate from the University of Toronto and worked as a research scientist (Plant Pathology) at Agriculture and Agrifood Canada until 2010. He accepted a position as Research Director at a newly formed company A&L Biologicals where he leads a staff of 5 researchers and 8 technicians. Their research program studies plant health from an ecological perspective where both beneficial and detrimental organisms in soil are considered to affect plant vigor. He has extensive national and international collaborators and has over 120 refereed scientific publications, numerous book chapters and one book. He is an adjunct professor at Western University, was president of the Canadian Phytopathological Society, and has organized and participated as keynote speaker in numerous national and international scientific conferences.

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Armin Schwarzbach, J Ecosyst Ecography 2017, 7:2 (Suppl)
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Armin Schwarzbach

ArminLabs, Germany

Tick-borne diseases: Challenge in diagnostics and therapies of chronic multiple infections

Lyme-Borreliosis and coinfections are the chameleon of symptoms, laboratory test results and therapy options. Many patients can be infected by tick-bites with several bacteria (multiple infections). Symptoms of tick-borne diseases are not highly-specific for Lyme-Borreliosis or other coinfections (overlapping symptoms). The diagnostic approach should be done by modern and innovative laboratory tests with the highest sensitivity and specificity for each infection. The evasion from the immune system of pathogens plays an important role in the problems of diagnostic testing and therapies in the complexity of chronic multiple infections. Autoimmune disorders, many unexplained syndromes or cancer can be correlated with chronic multiple infections initiated by tick-borne diseases. This presentation aims to show symptoms and corresponding laboratory tests for tick-borne diseases, explaining the different diagnostic test systems and general therapy options for chronic multiple infections, respectively pathogen interactions and biofilms.

Biography

Armin Schwarzbach is a medical doctor and a specialist for laboratory medicine from the laboratory ArminLabs, Augsburg, Germany. He began by studying biochemistry at Hoechst AG, Frankfurt/Germany and pharmacy at the University of Mainz/Germany in 1984. In 1985, he studied medicine for 6 years at the University of Mainz/Germany and finished his MD in 1991. He developed the worldwide first radioimmunoassay (RIA) for human Gastric Inhibitory Polypeptide (hGIP) from 1986 – 1991, getting his Ph.D in 1992. He is member of the Swiss Association for tick-borne diseases, the German Association of Clinical Chemistry and Laboratory Medicine and the German Society for Medical Laboratory Specialists. He is an advisory board member of AONM London, England and Board Member of German Borreliosis Society and member & former board member of the International Lyme and associated diseases society (ILADS) and has served as an expert on advisory committees on Lyme Disease in England, Australia, Canada, Ireland, France and Germany. He is the Founder and CEO of ArminLabs, Augsburg/Germany and is specialized in diagnostic tests and treatment options for patients with tick-borne diseases for over 15 years.

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Day 2

Jörgen Forss, J Ecosyst Ecography 2017, 7:2 (Suppl)
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Jörgen Forss

Linnaeus University, Sweden

Biotreatment of textile wastewater with continuous biofilter solutions and the associated microflora

Colors are very important in our lives; we express ourselves by the design of our clothes and shape our homes with colored textiles. We have several demands on the fabrics in our surroundings; we want them to durable against washing, sunlight, enzymes and ageing. Though, we give little thought on their impact on environment. With a few exceptions, extracting intense color from natural sources is quite rare. However, chemists started to develop dyes in mid-1800, which gave rise to the chemical industry. Today, most colors are manufactured synthetically and the major classes are azo and anthraquinone dyes. The process of dyeing is usually performed in water, with part of the dye inevitably ending up in the water. Textile dying processes pollute wastewater with recalcitrant azo and anthraquinones dyes. There is a need development of effective and affordable degradation systems for textile wastewater applicable in countries. We have worked with biodegradation of artificial and actual textile wastewaters in different biofilter solutions with carriers such as wood and rice husks. Degradation performances have been analyzed by spectrophotometry and liquid chromatography coupled with mass spectrometry. Constructed biofilter have performed over 90% decolorization with hydraulic retention times, roughly between 28-67 h. Molecular fingerprinting analysis (DGGE and 16S rRNA sequencing) revealed a diverse and dynamic bacterial community composition involved. Several identified bacteria in the consortium are known to carry azoreductase genes, such as *Dysgonomonas,* and *Pseudomonas*. Furthermore fungal internal transcribed spacer (ITS) gene fragments in the biofilters revealed the presence of fungal phylotypes such as *Gibberella* and *Fusarium*. Our findings emphasize that rice husk biofilters support a microbial community of both bacteria and fungi with key features for biodegradation of actual textile wastewater. These results suggest that microbial processes can substantially contribute to efficient and reliable degradation of actual textile wastewater.

Biography

Jörgen Forss has his expertise in biotechnical applications where different microorganisms are used to design wastewater solutions for industrial effluents. He has designed sustainable and cost efficient biofilters to treat wastewater from textile industries in development countries. He has worked both with white rot fungi and bacteria applications where microorganisms were employed in different designs and molecular fingerprinting was used to follow the microbial community composition and metabolites was analyzed with liquid chromatography coupled with mass spectroscopy (LC/MS). He has a strong belief that natural microorganisms possess all the necessary characteristics needed to degrade most compounds and circulate nutrients, if we can design the right environment for them.

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Andrew M Gordon, J Ecosyst Ecography 2017, 7:2 (Suppl)
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Andrew M Gordon

University of Guelph, Canada

The ecology of tree intercropping systems in Southern Ontario, Canada: Thirty-two years of research

Tree-based intercropping is a high-value, environmentally-beneficial agroforestry practice, well-suited to the climates and soils found in southern Ontario, Canada. Since 1984, researchers at the University of Guelph, Guelph, ON have been investigating ecological processes, crop responses and management protocols on a 30 ha intercropping research site, where a number of commercially-important tree species were intercropped at variable width with a variety of agricultural crops. This paper reports on the collective research conducted on-site over an approximately 30-year period. Results are presented for studies on row orientation, tree and crop physiology, tree-crop root interactions, economics and aspects of nutrient cycling and carbon-related processes. In addition, data is presented on the population dynamics of insects, birds, earthworms, mycorrhizae and crop weeds and diseases. Initially, the productivity of C3 agricultural crops intercropped with trees did not differ from those in corresponding sole-stand (conventional) systems of crops. But soil organic carbon content and bird and insect diversity increased in the intercropped area. The abundance and distribution of earthworms was higher closer to the tree rows indicating improved soil health. The C sequestration potential in tree-based intercropping systems varied from 2.5 to 3.7 times more than that reported for conventional agricultural fields in the region, depending upon the tree species. With reduced fertilizer use and more efficient N-cycling, tree intercropping could also lead to the reduction of nitrous oxide emissions from agricultural fields by about 0.7 kg ha−1 yr−1. With respect to water-quality enhancement, carbon sequestration, and biodiversity conservation, intercropping can be placed above conventional agriculture in terms of long term-productivity and sustainability.

Biography

Andrew M. Gordon received his B.Sc.F. (Forest Environment) from the University of New Brunswick in 1978 and a Ph.D. (Forest Ecosystem Ecology) from the University of Alaska in 1984. From then until his retirement in 2017, he was a faculty member in the Department of Environmental Biology (1984-2009) and then in the School of Environmental Sciences (2009-2017) at the University of Guelph, Canada. He attained the rank of full professor, and was the first Director of the Agroforestry Research and Development Program. His research interests lie in the investigation of ecosystem-level processes in both agricultural and temperate/boreal forest systems. He has worked in the boreal forest since 1978, and has directed a number of research projects looking at long-term plantation productivity. He has spent considerable time developing and promoting agroforestry systems in temperate regions for their ameliorative and restorative properties, including both intercropping and riparian systems to investigate reduced nutrient loadings to streams and other water systems. He has a strong interest in the interaction of terrestrial and aquatic systems, stemming from his senior undergraduate research on Narrows Mountain Brook in central New Brunswick. Dr. Gordon has a strong appreciation for the utilization of trees, forests and vegetation within the context of landscape level restoration of ecological processes. He is a licensed professional forester in the province of Ontario and a member of numerous professional organizations. He has also served as the Canadian representative to the International Energy Association (Short Rotation Biomass Fuels), was a Theme Director of CRESTech's (a former Ontario Centre of Excellence) Controlled Environments Research program, currently in collaboration with NASA to develop biological plant systems for extended space missions, and a former co-director of C.A.A.R.N. (the Canadian Afforestation and Agroforestry Research Network), at one-time, an emerging BIOCAP network. Dr. Gordon is the author and co-author of over 200 research Publications in both refereed and non-refereed journals, book chapters, technical communications, etc. He has advised over 50 M.Sc. and Ph.D. students, and is particularly proud of the fact that 19 of his former students hold professorial appointments at universities around the world. He has served on a multitude of University of Guelph academic and administrative committees, and has been involved in a number of provincial forest research initiatives. Dr. Gordon has considerable international experience in research, development, education and curriculum development in many countries (e.g. Nepal, Ghana, Chile, Bolivia, Indonesia, Vietnam, etc.) and currently has just finished directing a long-term CIDA Tier 1 project in Ghana entitled: "Agroforestry practices to enhance resource-poor livelihoods in Ghana". He is the President and CEO of Forest Environments Universal, a small consulting company specializing in many of the above topics.

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