2025 Abstract Award Winners

1st Place: Pedro Conceição

Title: The biogeography of mesotigmatid mite communities across a peatland latitudinal-successional gradient

Authors: Pedro Conceição[1] and Dr. Zoë Lindo[1]
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The distribution of organisms across geographic space is influenced by both current abiotic and biotic factors (e.g. temperature, competition) and historic patterns in abiotic conditions and biological events (e.g. Glaciations). In North America broad patterns of species distributions follows latitudinal gradients. Moss dominated peatlands, a type of wetland, are often used to examine patterns of glacial retreat as they form 'relic' landscapes across a wide ice retreat gradient. They are also habitat for species rich communities of soil-dwelling arthropods, such as mites. In this work, I am exploring the structure of communities of small arthropods known as mesosgmatid mite (Acari: Mesostigmata) in *Sphagnum* (moss) peatlands across a latitudinal-successional gradient in Ontario, investigating the environmental and historical factors underlying their composition. Specifically, the relationship between mesostigmatid mite community composition and current environmental factors across a temporal–spatial (post glacial) gradient of peatlands was examined. **Methods:** Seven peatland locations and 180 sample plots spanning a north–south latitudinal gradient of ~ 1300 km have been identified and sampled in 2023. These locations represent different estimated time since glacial recession. Southern sites are represented by small, fragmented peatlands while northern sites represent larger continuous peatland formations. Cores of peat-soil of approximately 10 cm3 were collected in each site along with environmental local variables. Sample plots were nested within sites at each location to allow for the partitioning of the role of space (geographic, dispersal processes) versus environment (ecological, niche processes) on community composition. Peat-soil cores were extracted for microarthropods using Tullgren funnels over 72 hours into 95% ethanol and all the mesostigmatid mites were enumerated and identified using taxonomic keys to species-level when possible. **Preliminary results:** Approximately 3,200 adult mites were identified into 52 species/morphospecies distributed in 16 families. Abundance and richness of mesostigmatid mites were lower in higher latitude sites compared to lower latitude. Community composition showed some degree of a latitudinal organization with northern communities being more heterogeneous when compared to southern ones, although there is more to investigate. Space and environment contributed to the distribution structure of the communities with pure space affecting it significantly more. Next steps include the incorporation of vegetation and peat age data in the analysis as well as the review of the natural history of the species found for the results interpretation and discussion. **Significance:** Understanding the current and historic factors that lead to current distributions of species can help us better predict how species will respond, and novel communities form, under current and ongoing climate change. The research outlined here will reveal historical patterns in soil biodiversity and the processes that generated these patterns during a period of rapid environmental change. In doing so, effective strategies can be established to promote the conservation of biodiversity since soils contain an estimated 60% of all life on earth. Peatlands are globally important systems in climate change predictions, and

whether the carbon stored in peatlands remains sequestered or is released back to the atmosphere is largely dependent on the biodiversity of the soil organisms.

2nd Place: Marcello De Giosa

Title: Potential of Biorational and Conventional Pesticides to Control *Acalitus simplex* (Acari: Eriophyidae)

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The Ruellia erinose mite (REM), *Acalitus simplex*, is an eriophyoid feeding on the Mexican petunia, *Ruellia simplex*. This plant is widely planted in ornamental landscapes, generating about $12 million in the industry. REM infestations compromise the plant's aesthetic by inducing the formation of open galls, called erinea. Despite its economic importance, chemical control strategies are lacking. This study aimed to (i) evaluate several pesticides and (ii) assess whether a curative spray (applied on existing erinea) or a prophylactic spray (applied before erinea formation) is more effective. Solutions (**Table 1**) were prepared at the maximum label rates in 50 mL of water, and 0.4 mL of each solution was applied using the Potter Spray Tower. Experimental units were 0.5 cm diameter leaf discs, either fully covered with erinea (curative) or without erinea (prophylactic). For the prophylactic spray, 30 REM were transferred to each leaf disc 24 hours after application. Efficacy was evaluated by recording REM mortality at 24, 48, and 72 hours. In the curative spray, efficacy was assessed by monitoring REM emergence from the erinea, with fewer or no emerging mites indicating higher efficacy. Ten replicates were used for each treatment including a water control. The experiment was repeated three times. A Generalized Linear Mixed-effects Model (GLMM), with a negative binomial error distribution was used to analyze REM mortality. Curative applications resulted in significant REM mortality (GLMM: $\chi^2 = 365.20$ df = 10, $P < 0.001$). Abamectin was highly effective, followed by garlic, mineral oil and carbaryl. Prophylactic applications also resulted in significant REM mortality (GLMM: $\chi^2 = 1729.23$ df = 10, $P < 0.001$). Abamectin and mineral oil were highly effective, followed by garlic and carbaryl. Abamectin and mineral oil, identified as the most promising treatments, and were subsequently tested in a greenhouse using the maximum label rate (**Table 2**). The experimental units comprised of plants with (curative) and without erinea (prophylactic). For the prophylactic spray, 30 REM were transferred per plant 24 hours after the treatment application. REM mortality was recorded weekly for one month, by recording new erinea formation. Each treatment had ten replicates per spray type, with the experiment repeated three times. A Kruskal-Wallis nonparametric test ($\alpha = 0.05$) was used to analyze REM mortality. Curative applications significantly reduced REM, preventing erinea formation on new plant tissue (Kruskal-Wallis: $\chi^2 = 52.65$, df = 14, $P < 0.001$). Prophylactic treatments also prevented erinea formation (Kruskal-Wallis: $\chi^2 = 408.4$, df = 14, $P < 0.001$). To further assess the efficacy of the treatments and the spray types, REM were extracted following Monfreda et al. (2007). Data were analyzed using GLMM with a negative distribution. Abamectin and mineral oil significantly reduced REM populations (GLMM: $\chi^2 = 51.84$, df = 2, $P < 0.001$) in curative applications, while prophylactic applications showed no effect (GLMM: $\chi^2 = 0$, df = 2, $P = 1$).

Our study highlights that either curative or prophylactic applications of abamectin and mineral oil can effectively control REM infestations in landscapes.

Reference

Monfreda, R., Nuzzaci, G., & De Lillo, E. (2007). Detection, extraction, and collection of eriophyoid mites. *Zootaxa*, *1662*(1), 35-43.

3rd Place: Ashani Hangawatte

Title: Utilizing Fluorescence In-Situ Hybridization to Detect *Streptococcus phocae* in Nasopulmonary Mites and Assess Their Role in Respiratory Disease Transmission in Southern Sea Otters

Authors: Ashani Hangawatte[1], Cody Warren[2], Francesca Batac[3], Melissa Miller[3], Risa Pesapane[1,4]

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Southern sea otters are often infested with nasopulmonary mites (NPMs); *Halarachne halichoeri* an obligate endoparasites that inhabit the respiratory tracts of marine mammals. These mites can cause significant pathology by invading both the upper and lower respiratory tract, leading to inflammation, mucosal irritation, epithelial damage, respiratory illness, secondary infections, and, in severe cases, death. Recent studies suggest that NPMs may play a role in facilitating respiratory infections by harboring *Streptococcus phocae*, an opportunistic bacterial pathogen associated with pneumonia, septicemia, and abscessation in southern sea otters. The reported prevalence of NPM infestations in southern sea otters is 25.6%, while *S. phocae* infections occur in 40.5% of cases. However, the exact role of mites in pathogen transmission remains unclear. They may facilitate infection by creating entry points through tissue damage, mechanically contaminating sites, or serving as biological hosts for bacterial propagation.

Here, we hypothesize that NPMs may serve as mechanical or biological vectors of *S. phocae*. To investigate this, we aim to determine the anatomical localization of *S. phocae* within NPMs using single-cell fluorescence in situ hybridization (FISH). This method employs fluorescently labeled RNA markers specific to *S. phocae*, enabling visualization of bacterial presence in different anatomical regions of the mites.

FISH probes targeting the *S. phocae* 16S rRNA gene will be designed and validated for specificity. Nasopulmonary mites (NPMs) will be fixed and treated to reduce autofluorescence. Hybridization will be carried out using fluorescently labeled probes and nuclear stain in a buffered solution, followed by incubation under controlled conditions. After sequential washing, the samples will be

mounted and examined using an epifluorescence microscope to visualize probe binding and bacterial localization.

If *S. phocae* is localized solely within the digestive tract of NPMs, it would suggest bacterial acquisition through feeding, indicating a lower likelihood of direct transmission to marine mammal hosts. However, if *S. phocae* is detected in the mouthparts or systemically throughout the mites, it would suggest a higher potential for transmission, supporting the role of NPMs as either mechanical or biological vectors.

This study applies a novel fluorescence in situ hybridization (FISH) assay to detect *S. phocae* within NPMs, advancing molecular techniques for wildlife disease research. While FISH is widely used in microbial ecology, its application in parasite-pathogen interactions remains limited. By developing species-specific probes and optimizing FISH for arthropod parasites, this study provides a powerful tool for investigating pathogen transmission in host-parasite systems.

Understanding the role of NPMs in *S. phocae* transmission has significant implications for marine mammal disease management and conservation. Since similar mites infest other marine mammals, these findings may enhance disease surveillance and inform mitigation strategies across species. If NPMs contribute to bacterial infections beyond mechanical damage, even low mite burdens could pose a risk, particularly for immunocompromised individuals in rehabilitative care. This research enhances understanding of parasite-associated pathogen transmission and highlights the need for a holistic approach to wildlife disease ecology. By applying FISH to study parasite vector potential, it offers a framework for broader wildlife disease studies, aiding conservation and disease prevention efforts.

4th Place: Elizabeth H. Foley

Title: What triggers chiggers? Evaluating attraction using chemosensory cues

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In the United States, chiggers are considered a nuisance biting pest. However, in many parts of the world, chiggers, such as *Leptotrombidium deliense* are the primary vectors for *Orientia tsutsugamushi*, the causative agent for scrub typhus. Scrub typhus is a rickettsial illness which, until recently, was thought to be geographically limited to the tsutsugamushi triangle (from Japan and Russia, south to Northern Australia and west to Pakistan), but has now been identified in India, Africa and South America. We currently do not know the extent to which this pathogen is present in the North America. Recent studies have found *Orientia* spp. in the microbiome of North Carolina chiggers, leading scientists to ponder the role, if any, chiggers play in the maintenance of rickettsial agents in the US. Are chiggers partially to blame for the rise of these diseases in the last decade? Unfortunately, chigger surveillance is difficult, and methods are extremely limited and grossly under-studied Our team focused on trapping and surveillance efficacy. We hypothesized that chiggers use chemosensory cues to orient toward hosts and therefore, synthetic attractants could be used to lure them to a source. The goals of this study are: (a) evaluate chigger response to five different chemical compounds and one thermal stimulus, (b) determine approximate attractant dosage for use in field traps, (c) analyze general chigger

behavior and orientation when presented with chemical stimulus. Ultimately, we hope to identify potential attractant(s) to aid in chigger surveillance for future studies in the US and improve overall understanding of chigger behavior in response to stimuli. We chose chemicals that have previously shown to attract other parasitic arthropods such as octenol, lactic acid, putrescent whole egg solids, carbon dioxide, and ammonia. A thermal stimulus response was also evaluated since other acari, such as ticks, have reportedly shown strong attraction to heat. The experiment was conducted at the Armed Forces Institute of Medical Research in Bangkok, Thailand with a laboratory-maintained chigger colony. Using a Y-tube olfactory bioassay, 20 chiggers were placed in a 15 cm long Y-tube arena for 30 minutes. This choice bioassay included a pathway containing the attractant and another with ambient air as the negative control. An air delivery system was used to humidify and provide a constant rate of air flow through the arms of the Y-tube. For thermotaxis, a 50 cm choice straight track model was used with 35-45°C at one end, and 20-25°C at the other. Attraction was determined when the chigger crossed a pre-determined line toward either choice. Six replicates per attractant were conducted for a total of 120 chiggers evaluated per treatment. To determine attraction, a generalized linear mixed model with binomial distribution was used. Results of this study will help future researchers and public health technicians across the US better evaluate the role chiggers play in local disease ecology. This study was the first of its kind to evaluate chigger attractants.

5th Place: Allan Busuulwa

Title: Assessing the Potential of *Neoseiulus californicus* (McGregor) (Mesostigmata: Phytoseiidae) for Concurrent Management of Two Key Strawberry Pests in Florida

Authors: Allan Busuulwa [a], Abigail Campos Gutiérrez [b] and Sriyanka Lahiri [a]

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Many thrips species, particularly those in the family Thripidae, are major pests of many crops worldwide. In Florida's strawberry production, *Scirtothrips dorsalis* Hood (Thysanoptera: Thripidae) is the most significant pest, capable of causing up to 60% crop damage to an industry worth over half a billion dollars if left unmanaged. Additionally, twospotted spider mites, *Tetranychus urticae* Koch (Acari: Tetranychidae), are also common pests found infesting strawberries. During the strawberry season (October to April), both pests can often be found infesting strawberry plants at the same time.

Current pest management practices are increasingly incorporating predatory mites, an approach aimed at reducing reliance on insecticides and miticides. Current research on the use of predatory mites in strawberries has primarily focused on a single predator species targeting either *S. dorsalis* or *T. urticae* individually. However, studies examining the effectiveness of a single predatory mite species in controlling both pests simultaneously are lacking.

Thus, the aim of this study is to evaluate the potential of *Neoseiulus californicus* (McGregor) (Mesostigmata: Phytoseiidae) for the simultaneous control of both *S. dorsalis* and *T. urticae*. The rationale for using *N. californicus* is that compared to other predatory mites, this commercially available species has demonstrated the ability to effectively penetrate *T. urticae* webs to feed on them while also demonstrating the ability to suppress various thrips.

To this end, *N. californicus* were purchased from a commercial supplier and reared on both *S. dorsalis* and *T. urticae* for multiple generations. To obtain predators of the same age, gravid females were transferred to an oviposition arena for 24 hours to lay eggs. After oviposition, the females were removed, and the eggs were allowed to hatch. Once hatched, the predators were provided with *S. dorsalis* and *T. urticae* as a food source until they reached adulthood. Successively, these predators were used in choice and no choice bioassays. In the choice bioassay, predators were offered a combination of all life stages of *T. urticae* along with *S. dorsalis* larvae. In the no choice bioassay, predators were provided with either *S. dorsalis* larvae or a selection of *T. urticae* life stages, including eggs, nymphs, and adults.

We hypothesize that *N. californicus* will feed on both *S. dorsalis* and *T. urticae*, with a stronger suppression effect on *T. urticae* followed by *S. dorsalis*. Therefore, we predict that *N. californicus* will effectively suppress both pests in both the no choice and choice bioassays, highlighting its potential as a valuable tool for integrated pest management in strawberries. Its ability to control both *S. dorsalis* and *T. urticae* simultaneously positions it as a promising option for dual pest suppression in strawberry production.