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## Entomology Outreach Presentations to Four Audiences

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**Michael Goldman MPH, BCE**

**ENT 888 - Master's Project**

### **Entomology Outreach Presentations to Four Audiences**

**Abstract:** I proposed that my master's Project would be outreach on Entomology at four levels - School aged children, laymen, non-entomologists in a technical field, and entomologists. The idea here is basically how to talk about entomology to varying levels of expertise, from first graders to experts in both entomology and occupational health and safety. Presentations were given to audiences at each of the four levels. The specific topics varied for each audience. The determination was made by the inviting audience in the cases of school aged children and adult laymen and by me in the cases of Occupational Safety and Health professionals and professional entomologists. Additionally, two of the presentations in this project shed light on an aspect of occupational safety and health that results in as many as ten fatalities and thousands of injuries each year in American workplaces. The value of this project was to gauge reactions and responses to information on entomology presented to audiences typically not dealing with this subject. Or in the case of entomologists, an aspect of entomology that they had previously not considered.

## **Introduction**

While I focused on entomology and herpetology as an undergraduate at Florida State University, I ended up in a 30-year long occupational safety and health career. During that time, I dealt with numerous incidents of stings and bites in the workplace, many of them have been OSHA recordable (above and beyond first aid medical treatment) and I have always thought that there was a dearth of regulatory information on controlling these hazards in the workplace. Additionally, I have encountered numerous people that have an irrational fear of insects. I earned a master's in public health (MPH) from Emory University and a graduate certificate in Medical Entomology from University of Florida and have been seeking to pull those two disciplines together ever since.

It is my belief that outreach and education from entomologists can help these situations. Exposing children to the world of insects may be something that influences them to have a life and career in the sciences. For layman adults, an increased appreciation for insects only leads to deeper and broader appreciation of all the natural world. For Environmental Health Science ? (EHS) professionals, a greater awareness of insects in the workplace could prevent insect related incidents and injuries. This workplace based information and history can also provide professional entomologists with a new perspective on the study of insects by adding regulatory and preventative aspect to their identification, evaluation and control

## **Materials and Methods**

This outreach project included a total of six presentations. Three were given to school aged children and three were presented to adults with varying degrees of entomological expertise.

Three of the outreach events included a PowerPoint presentation with a lecture and a question-and-answer period. When presenting to children I did not use a developed PowerPoint presentation since I was told ahead of time by their teachers that presenting in that style would only confuse and bore the students. For these presentations, I drew on a white board as I talked and passed out insects preserved in plexiglass cubes.

A significant aspect of the presentations was sufficient time for questions and answers. Questions to the audience such as "How many of you have been stung by a wasp?" or "How many of you had head lice as a kid?" were excellent icebreakers and often lead to interesting discussions. However, presenting to the Georgia Entomological Society was limited to 10 minutes with 2 minutes of question-and-answer.

**School Aged Children** - The school children presentations included:

- "What is an Insect?" was presented to two schools this spring. There was not an evaluation of the students in the form of a test or quiz. It should be noted that one group is a school for autistic children and many kids in the class are largely non-verbal. The first presentation was given on February 2, 2023.
- The presentation of "What is an Insect" was given on April 12, 2023, at the Katherine Hamm Center of the Atlanta Speech School.
- A third presentation was given at the In-Town Montessori School. This presentation was requested by concerned parents when the yard of the school held a high number of mining bees (Hymenoptera: Andrenidae). I was asked to speak to the children and faculty about stinging insects and why the Andrenid bees did not pose a threat. This presentation was given on March 19, 2023.

**Non-Entomologists in a non-technical setting** – The first adult level presentation was presented at a Florida "Science Salon" on March 7, 2023, in Tallahassee, Florida. The Science Salon series is hosted by the Waterworks nightclub and given monthly. A visiting scientist is invited to discuss their work or other topics of interest. I presented on insects of the Florida panhandle and discussed their ecological role and importance. There was a PowerPoint presentation that included photographs of insects of the southern United States that audience members may encounter or may find interesting.

**Non-Entomologists adults working in a technical field** – The presentation "Dealing with Arthropods in the Workplace" was given at both the American Industrial Hygiene Association (AIHA) national conference and at the Georgia local AIHA section conference in the spring 2022. The presentation was revised and presented again as a webinar to the AIHA on July 12, 2023. Specifically, it covered the health effects of arthropods in the workplace as well as covering some basic first aid responses and methods of control and avoidance.

**Professional Entomologists** – The presentation titled "Occupational Safety Regulations in Controlling Insect Hazards: Recognizing Potential Exposures to these Biological Hazards and Avoiding the Resultant Injury and Illnesses" at the Georgia Entomological Society meeting on April 19, 2023. This presentation covered the regulatory aspect of insects in the workplace and potentially concerning trends such as the

expanding range of the Asian long horned tick (*Haemaphysalis longicornis*) and what that may mean to American workers.

It was not possible to test the before and after knowledge of the audience since the presentations were informational in nature as opposed to formalized educational teaching scenarios.

## **Discussion**

**School Aged Children** - While adults typically have had the most experiences with arthropods, children often have the best questions. I have very little personal experience presenting to children, in fact, I have very little personal experience with children of any sort. It was disconcerting to attempt to present while they talked and wiggled around constantly. This was most apparent at the Montessori school, where apparently everyone speaking at once was not only tolerated, but it was also actively encouraged. Once the children settled down and we were able to work through the material, I was very impressed with the complexity of some of the questions. Of course, some of questions were things like a child raising her hand simply announcing that she had seen a butterfly. However, other questions on subjects ranging from which insects were more closely related to each other to how different insects avoided predation indicated a high level of complexity in their thinking and ability to grasp these concepts.

Presenting to children dealing with autism was a high point of this project. During the first presentation, a child approached me with a preserved insect and asked me to identify it. I noticed that his teachers were watching this unfold with their mouths agape. After the presentation, they told me that he was completely non-verbal. I responded that obviously he wasn't, he just hadn't found anything that he wanted to talk about until then.

I will be the first to admit that I have no expertise on educating children, this experience leads me to believe that entomology is an excellent entry into the biological sciences for younger children. They typically have familiarity with insects and understand some basics of ecology and even taxonomy. The study of insects can open the doors to more complex topics such as morphology and evolutionary theory.

One aspect of entomology that seemed to fascinate children? was the feeding strategies of different insects. What species of insects ate what other animals was a recurring theme and question. They also seemed to be fascinated by aposematic coloration.

Another practical aspect of presenting entomology to school aged children is teaching them some basics of avoiding getting stung. “If it’s striped and brightly colored, don’t pick it up” was a basic concept they seemed to catch quickly.

**Non-Entomologists in a non-technical setting** – The Science Salon is a fun and relaxed event and turned out to be an excellent way to engage adults in the discussion of entomology. The point of this presentation was to tell the audience that just by living in the Florida panhandle, they were in the midst of an ecological and entomological wonderland and that these natural resources were worth study and preservation. I prepared a PowerPoint presentation with photographs of interesting local insects that they are likely to find themselves by visiting local parks and wildlife refuges.

The technical side of the presentation discussed why insects were so numerous and so successful. This led to a discussion of their ecological importance. A high percentage of the audience were hikers and outdoors activities enthusiasts, making these concepts an easy sell. Numerous audience members related stories of insects that they had seen in various settings and asked for identifications and additional information. One insect that seemed to stir up interest were scorpion flies; it took some explaining to get across that these were not actually flying scorpions but a standalone order of insects. Most of the audience had not knowingly seen one in the wild although they are not uncommon in the area. To trained entomologists, a species like a dobsonfly may not be so strange; however, to the unfamiliar, it may seem as bizarre as a species from a far-off galaxy.

I see a huge amount of value in this level and style of presentation. Most of the participants were familiar with ecological and conservation related ideas and were eager to talk about them. The relaxed and informal setting made the conversations easy.

**Non-Entomologists adults working in a technical field** – Safety professionals and industrial hygienists are familiar with the concept of “recognize, evaluate, and control” when dealing with occupational hazards including chemical hazards and physical hazards such as noise in the workplace but applying these concepts to whole organism biological hazards including arthropods was unfamiliar to the audience that I presented to.

The presentation “Dealing with Arthropods in the Workplace” was adapted from a previous presentation that had been given at the national AIHA conference and at the local Georgia AIHA conference the previous year. All three of the presentations were well received. The national presentation from 2022 was scored a 4.5 out of 5 by the audience. The most recent evaluations will not be available until late

August or early September. The most recent presentation was one part of a three-part webinar series that also included presentations on poisonous plants, venomous snakes, and hazardous animals such as feral dogs in the workplace. The presentation is found at this site - <https://www.aiha.org/events/aiha-university-3-part-webinar-series-preparing-for-and-controlling-biological-hazards>.

While many of the safety and environmental professionals had experienced workplace issues with arthropods, few of them had much in the way of entomological training and were unaware of methods of avoidance or treatment of medical issues. For example, it is commonplace for physicians to prescribe antibiotics in cases of insect stings. The audience assumed the reason was to prevent infections. In fact, infections caused by insect bites and stings are uncommon, yet a prescription guarantees that the reporting workplace experiences an OSHA recordable injury. Most physicians are not trained in treating insect stings or bites, so, a workplace where an employee seeks treatment for an insect bite or sting experiences often experiences a recordable injury that could have been prevented by not requiring a needless prescription. Similarly, if a safety professional understood a few basic ideas about avoiding stings, workplace procedures can be put in place that would greatly reduce insect related injuries. A case in point, no one in the audience knew that bees and wasps see red very poorly or that insect eyes detect motion more readily than objects. A worker in light blue clothes flapping his arms while working was exhibiting riskier behavior. This information alone could potentially reduce the number of workplace stings.

Other aspects of potential hazards from arthropod exposure in the workplace were discussed during this talk. These included potential workplace exposure to mosquito and tick-borne disease, delusional parasitosis, and acquired allergies from insects such as mealworms or cockroaches. With the exception of the mosquito and tick-borne diseases, admittedly these issues are not common. Yet, in my career, I have seen delusional parasitosis twice and it is very important that a safety and health professional handle these cases with some compassion and care. The percentage of safety and health professionals that know about this issue is very small.

The mosquito and tick-borne diseases garnered further discussion with the mention of the spread of introduced species including the Asian tiger mosquito (*Aedes albopictus*) and Asian Long horned tick (*Haemaphysalis longicornis*). Both species are expanding their range in the US and have the potential to infect workers with numerous pathogens. Since many workers are unaware of the presence of these arthropods and the dangers they can present, it is possible that many workplace exposure scenarios may

go unrecognized and therefore uncontrolled. The recent detection of malaria in south Florida may also make further discussion in this area worthwhile.

**Professional Entomologists** – The talk I presented to the Georgia Entomological Society turned out to be a bit of an outlier for the audience since the society is dominated by the students and faculty of the University of Georgia which is in turn predominated by agricultural research.

The presentation focused on the injury and illness trends in the workplace and the lack of response by regulatory occupational safety and health agencies such as OSHA and the National Institutes of Occupational Safety and Health (NIOSH). While admittedly the rates incidents caused by arthropods does not compare in incidence to some other more obvious safety and health issues such as falls from elevations or chemical exposures, but the fact remains that US workplaces experience as many as 5,000 OSHA recordable injuries and as many as 10 fatalities a year due to stings and bites from arthropods. And any serious safety and health professional would agree that even one injury is too many. Most entomologists have never considered this to a worthwhile subject of study or discussion much less an endeavor that potentially reduces human suffering.

In each of these presentations, there was no opportunity to assess what the audience had learned. These were not classroom settings where quizzes or tests would have been acceptable. In the case of presenting to children, I was told ahead of time that they wouldn't respond well to that. The presentations to adults were in either casual or conference related presentations. Assessments of the audience engagement, however, could be assessed from the questions at the end of the presentation. In each case, there were numerous questions that ranged from the insightful to the pedestrian. If I had to define trends, I would say that children want to talk about insects that they have seen and that adults are worried about invading murder hornets.

## **Conclusions**

Presenting subjects related to entomology is rewarding from several perspectives. Each of these presentations allowed me to speak to an audience that was either not used to discussing insects in depth or allowed me to present insects in ways that were not often or previously considered.

School aged children are typically fascinated by insects but don't often encounter anyone with actual expertise. I am afraid that school visits by "The Bug Man" are going to continue long after this project is complete, and I am fine with that. It is impossible to overestimate how powerful an experience it was to



have a non-verbal autistic child asking questions simply because he encountered an insect that he was unfamiliar with. And I am sure I will eventually learn to navigate a room full of Montessori children all blurting out questions at once. Finally, being able to tailor a talk to an immediate concern of parents, such as in the presence of Andrenid bees, helped calm needless fears and may have also helped increase their appreciation of insects.

Presenting to adults in a nontechnical setting can increase the general awareness and appreciation of insects. Few people know that there may be over 5 million insect species in the world and that many of these are under current threat of extinction.

It was also interesting to explain to an audience of laypeople why insects are so successful. It had simply not occurred to most people that the wide diversity in morphology of insect mouthparts meant the ability to exploit such a wide variety of food sources and that flight meant the ability to disperse over wide distances.

While I did cover a few dramatic species that I had seen in the Amazon, the audience was surprised to find that so many unusual species were common in the nearby parks and wildlife refuges. I repeated the uniqueness of the panhandle of Florida in terms of entomology and reminded the audience that they were sitting right in the middle of it. Many were shocked to learn that one of the most painful insect stings on the north American continent, the Florida harvester ant (*Pogonomyrmex badius*), may turn up in their own yards. These discussions led to larger questions about conservation and preservation of species. Additionally, many in the audience did not even realize that one of the foremost researchers, Walter Tschinkle in the study of ants taught in town at Florida State University.

Speaking in more technical settings can illuminate aspects of entomology as well as aspects of seemingly unrelated fields that the audience may not have previously considered. Perhaps down the road, OSHA or NIOSH may include the safety and health considerations of insects in the workplace in their regulatory canon and these 5,000 incidents of injury and illness due to arthropods? could be dramatically reduced.

The primary thing that I will take forward from this degree program is that I am likely the only credentialed safety and health professional (Certified Industrial Hygienist, Certified Safety Professional, Master of Public Health) that is also credentialed in entomology (Board Certified Entomologist and MS in entomology upon completion of this semester). I have given similar presentations on this topic previously and will likely continue to speak on this numerous times going forward. OSHA and NIOSH may never take notice but so far audiences have responded well.

Finally, presenting to other academics is rewarding as well, even if you are bringing a different slant in terms of perspective. There is barely a facet of human life that insects do not touch. As thrilling as the ecology and diversity of insects is and as crucial as preserving them is to healthy ecosystems of this planet is, insects are also responsible for untold human suffering. Our understanding and our effectiveness as entomologists can be deepened considering as many of them as we can. In seeking opportunities to talk about insects we can deepen that understanding for ourselves as well as for our audiences.

## **Appendix 1 Science Salon Presentation**

## **2 – Georgia Entomological Society Meeting Presentation**

### **Appendix 3 –American Industrial Hygiene Association Webinar Presentation**

## **Appendix 4 – Photograph Log**

