TMU – SUNY Oneonta Biology Symposium

TOKYO METROPOLITAN UNIVERSITY
首都大学東京

Craven Lounge, Morris Conference Center, SUNY Oneonta
10 am – noon & 5 pm – 6 pm, February 21, 2020

SUNY ONEONTA

TMU - SUNY Oneonta Biology Symposium
Presentation schedule

February 21, 2020, 10:00 – noon & 5:00 pm – 6:00 pm

Craven Lounge, Morris Conference Center, SUNY Oneonta, Oneonta, NY, USA

Oral presentations

Morning Session (10 am – 12 noon):

Moderator: Kiyoko Yokota (SUNY Oneonta)

10:00 – 10:10am: Jo Kutsukake, Classification of Japanese Symphyla

10:10 – 10:20am: Jeremy Pember, Exploring the poorly known thorny-headed worm *Neoechinorhynchus carpiodi*

10:20 – 10:30am: Miyu Enomoto, The effect of amaranth (Red No. 2) on the lifespan of *Drosophila melanogaster*

10:30 – 10:40am: Shohei Takaki, Gravitropism in mushrooms

10:40 – 10:50am: Sierra Stickney, Connecting with the public to prevent aquatic invasive species (AIS)

10:50 – 11:00am: Arisa Tamura, Application of metal chloride to *Aspergillus niger* living with host plants

11:00 – 11:10am: Mayu Nishino, Isolation of cyanobacteria with high photosynthesis under strong light conditions

11:10 – 11:20am: Sarah Coney, The re-introduction of American Eel to the Upper NY Susquehanna Watershed

11:20 – 11:30am: Toko Hisano, Do plants grow with domestic wastewater?

11:30 – 11:40am: Claire Curtin, Parasites of Redhorse fishes

11:40 – 11:50am: Yuna Taki, Effects of ultraviolet light on the growth of plants

11:50 – 12:00pm: Yuuka Hasegawa, UV pattern of flower and its breeding method

Afternoon Session (5:00 pm – 6:00 pm):

Moderator: Sarah Coney (SUNY Oneonta)

5:00 – 5:10 pm: Welcome!

5:10 – 5:25 pm: Yuka Uchino, Condition to change speed of cytoplasmic streaming

5:25 – 5:35 pm: Brian Mullin, Invasive copepod Infections of introduced salmonids in Lake Ontario

5:45 – 5:55 pm: Kanon Matsumoto, Change of calcium oxalate from plants under various conditions

Poster only (all day)

Stephen Deforest, Species distribution modeling of *Calopteryx maculate*

Eleanor Rettew, Aquatic macroinvertebrates in previously unsampled tributaries within the Susquehanna Watershed

Presentation abstracts

Oral and poster presentations

Morning Session (10 am – 12 noon):

10:00 – 10:10 am
Jo Kutsukake (TMU)

Classification of Japanese Symphyla

Symphylans are soil-dwelling arthropods belonging to Class Symphyla. About 220 species are described worldwide. In Japan, there are only three species described in 1954. Since then, Japanese species of symphylans have been poorly characterized. This study aimed to identify and classify possible new species of Japanese symphylans using standard morphological as well as modern molecular taxonomic techniques. Samples of symphylans were collected from layers of litter and soil in about 20 places in Southern Japan, by picking or by using Tullguren funnel method. Specimens were identified morphologically as members of Family Scutigerellidae. Two species identified as *Hanceniella* sp. and *Scutigerella* sp. were processed for DNA extraction by proteinase K. Genomic DNAs were sequenced using a universal primer for mtCO1. Using ChromasPro, DNA sequences were assembled, and the phylogenetic tree was constructed using MEGA7. Phylogenetic analyses show that there are three clusters formed in the tree with a 0.20% difference, suggesting that there might be four species of symphylans existing in Japan. Interestingly, specimens taken from Tokyo Metropolitan University (TMU) soil samples differ from other specimens in size and presence of seta on tergites. A combination of morphological and molecular techniques in the present investigation identified a novel species of symphylans, which needed further studies.

10:10 – 10:20 am

Jeremy Pember (SUNY Oneonta)

Exploring the poorly known thorny-headed worm *Neoechinorhynchus carpiodi*

This work is part of a broader effort to fix the genus *Neoechinorhynchus* by collecting more information because it is poorly studied. In a recent SUNY Oneonta funded research trip in summer 2019, we traveled to Lake Erie and dissected Quillback to find *Neoechinorhynchus carpiodi* which is found only in that type host and type locality. The only known information about this species originates from two articles, one of which is the original description. That information is over 50 years old with no subsequent work. Therefore, updated measurements and ecological data need to be acquired to more deeply understand this parasite species. My objective is to use identification techniques that were not previously included, scanning electron microscopy (SEM), as well as other newly acquired data, to improve identification and understanding of *N. carpiodi*. I have obtained SEMs as well as a majority of the measurements for the 25 worms (15 male and 10 female). The measurements I have taken seem to match the sizes given with the original description. However, my measurements have expanded the known sizes of this parasite.

10:20 – 10:30 am

Miyu Enomoto (TMU)

The effect of Amaranth (Red No. 2) on the lifespan of *Drosophila melanogaster*

Amaranth is one of the coloring dyes used in many food industries. Although it is banned in other countries, some still used this dye to color the food artificially. Previous study had shown a decrease in sperm survival time and suppression of the estrus period when this coloring was administered to rats. In our study, we determined the lifespan of *Drosophila melanogaster* fed with Amaranth coloring dye incorporated in the diet. Different concentrations (for example, 0.15%, 0.20%, 0.25%) of the Amaranth were used to feed the fly. Unexpectedly, results showed that the amaranth-fed *D. melanogaster* have longer life span compared with the control (no Amaranth food). *D. melanogaster* fed with 0.25% amaranth had the highest survival of 47 days. Our experiment showed that the Amaranth coloring dye incorporated in the diet increased the lifespan of *D. melanogaster*. However, the effect of the amaranth to the physiology of the fly still needs further investigation.

10:30 – 10:40 am

Shohei Takaki (TMU)

Gravitropism in mushrooms

Gravitropism is a mechanism that enables the organ or parts of the plants to grow in response to gravity. This mechanism occurs in many mushroom species; however, the conditions influencing such response to gravity have not been entirely explained. In this study, gravitropic responses of "Shiitake" mushrooms in Japan grown under the different environmental conditions were observed. In the first experiment, mushrooms were grown on a plate in the absence of light by covering them with black vinyl. These were subjected to different temperatures (15o C, 20o C, 25 o C), pH (using Peat moss and Calcareous soil), and fertilizers using plant-vitalizing liquid. Results show that the bending of the mushroom was faster as we increased the temperature indicating that 20°or higher temperature makes bending better. A strong gravitropic response was also observed at high pH (using peat moss), suggesting that high pH makes a better bending. No significant difference in the response was observed when the mushrooms were subjected to plant fertilizer, indicating that the gradient in the vitalizing liquid does not significantly affect the bending. In the second experiment, we subjected the mushrooms to light conditions and observed their gravitropic responses. Results show that light conditions affected the bending process. Hence, we observed the effects of different light wavelengths to the mushrooms in our additional experiment using green and red lights. The wavelengths of light (green) seemed to contribute to the mushrooms' gravitropic response. Overall, environmental conditions such as temperature, pH and light wavelengths have influenced the gravitropic responses of mushrooms in the present investigation.

10:40 – 10:50 am

Sierra Stickney (SUNY Oneonta)

Connecting with the Public to Prevent Aquatic Invasive Species (AIS)

Aquatic Invasive Species (AIS) are wreaking havoc on both marine and freshwater ecosystems worldwide. AIS can cause algal blooms and declines of native organisms, which eventually will damage the overall health of the ecosystem. Once an invasive species has successfully established itself in a waterbody, its eradication is near impossible, and population control is often very costly. The cause of AIS is primarily due to the transportation of various watercrafts moving between locations, without proper cleaning of the vessel prior to transport. The only effective solution is prevention; therefore, education is the key.

The Catskill Regional Invasive Species Partnership (CRISP) is a non-profit organization working to inform the public about AIS in the greater Catskills region of New York State. CRISP has hired numerous "boat stewards" to check watercraft leaving or entering a site, at no charge to boaters, to prevent AIS such as Zebra mussels (*Dreissena polymorpha*) or curly leaf pond weed (*Potamogeton crispus*). By checking for AIS and cleaning boats, CRISP can mitigate and prevent the risks of AIS. Additionally, CRISP stewards connect with boaters by explaining what type of AIS are in the specific body of water and teaching boaters on how to properly clean the boat themselves. Connecting through the shared appreciation of a waterbody allows for the boaters to see the value in prevention. Traveling from place to place has never been easier. Yet, we need to ensure that our modes of transportation are not harboring invasive species in order to protect native populations.

10:50 – 11:00 am

Arisa Tamura (TMU)

Application of metal chloride to *Aspergillus niger* living with host plants

Aspergillus niger have been widely known as causative agent of infectious diseases of plants. Many plants have been considered as hosts of *A. niger* posing a threat to plants' health condition. Thus, it is important to develop new pesticide which prevent propagation of black mold without being harmful for plants. Metal ions are well-known with their antibiotic properties. To examine the antibiotic effect of metal ions to *A. niger* population, I applied metal chlorides (ZnCl2, KCl, NiCl2) to *A. niger* in three concentrations (1.0mM, 3.0mM, 5.0mM). Since it showed strong and stable antibiotic effect in all concentrations, NiCl2 is the most effective pesticide while, high concentrations of NiCl2 is harmful to plant. In order to demonstrate the NiCl2 phytotoxicity level in detail, NiCl2 at four different concentrations (10mM, 1mM, 0.1mM, 0.01mM) were applied to the leaves of *T. fournieri*. It showed that 10mM of NiCl2 has significantly high phytotoxicity levels whereas 1mM showed low phytotoxicity. I couldn't observe the phytotoxicity effect in 0.1mM and 0.01mM. To further narrow down the optimum concentration, I conducted the same procedure using different concentrations of NiCl2 (0.5mM, 0.75mM, 1mM, 1.25mM). NiCl2 showed high effectiveness in 0.5mM and 0.75mM with low phytotoxicity. Finally, I measured the effect of NiCl2 against *A. niger* on the leaves. *A. niger* was applied in spraying and spore adhering methods. After two days of inoculation, the plastic bag and the medium were removed, then NiCl2 was sprayed. Conditions of leaves were observed to determine the effectiveness of NiCl2 as a pesticide. Results showed that NiCl2 is effective

between 0.5 and 0.75mM since seedlings with symptoms of black molds were observed more in 0.5mM, while effect of phytotoxicity of NiCl2 appeared more in 0.75mM.

11:00 – 11:10 am

Mayu Nishino (TMU)

Isolation of cyanobacteria with high photosynthesis under strong light conditions

Global warming is currently progressing. CO_2 is one of the major causes of global warming, which has been reported to increase significantly. This issue posed a severe problem on our planet that needs to be addressed. Therefore, we desire to develop a way of reducing CO_2 by the use of photosynthesis. We are interested in cyanobacteria because they generally have a higher ability of photosynthesis than plants. The higher CO_2 concentration and light intensity are, the more actively cyanobacteria photosynthesize. However, if there is an exceedingly large amount of light, cyanobacteria are prone to photoinhibition, thereby unable to photosynthesize. In this study, we would like to find cyanobacteria, which can potentially resist intense light and could still photosynthesize. We collected samples in different environments such as marine and fresh waters. Cyanobacteria were isolated and cultivated on petri dishes using BG11 and f/2 media. After isolating the cyanobacteria, we did light variation by changing the amount of light (8300lux, 12400lux, 16500lux) and incubated for 6 days with strong irradiance. After 6 days, we observed the growth of cyanobacteria. Cyanobacteria that developed on agar plates were identified based on morphological characteristics. We discovered that cyanobacteria could grow with strong light irradiance suggesting that they can potentially perform a photosynthetic activity with strong light conditions. Further studies are being done to identify the species of the isolated cyanobacteria.

11:10 – 11:20 am

Sarah Coney (SUNY Oneonta)

The Re-introduction of American Eel to the Upper NY Susquehanna Watershed

Regional and global connectedness via faster and more affordable transportation has resulted in non-native and invasive species negatively affecting native species globally. Furthermore, development often causes habitat fragmentation and loss of connectivity within ecosystems. My thesis work focuses on re-establishing lost connections and reversing the negative side effects of certain connections through the reintroduction of American eels (*Anguilla rostrata*) to the New York section of the Susquehanna River watershed. Dams across the Susquehanna River in Pennsylvania and New York currently prevent American eels from returning to this watershed from the ocean. They were once a significant part of the local aquatic fauna. American eels are the most effective host of a native riverine pearly mussel, the Eastern elliptio (*Elliptio complanata*). The extirpation of American eels has led to declines in the latter as well as contributed to flourishing rusty crayfish (*Faxonius rusticus*) populations, an invasive species originally from Ohio, Indian, and Kentucky. As one of the historically most populous freshwater mussels, Eastern elliptio play an important role in the >71,225 km2 Susquehanna watershed, such as recycling nutrients and stabilizing sediments. The invasive rusty crayfish escapes predation by most native fish and negatively affects the benthic communities in the Susquehanna watershed. American eels have been shown to consume rusty crayfish and may potentially serve as effective predators. Little is known of the American eel in the Susquehanna watershed. This study aims to better understand the American eel as a species and its role in the ecosystem.

11:20 – 11:30am

Toko Hisano (TMU)

Do plants grow with domestic wastewater?

Water pollution has become a more serious global environmental issue these days. Domestic wastewaters coming from non-point sources have polluted aquatic life such as rivers and oceans, which sometimes considered as tourist spots. Domestic wastes such as shampoo, dishwashing detergents, and other chemical pollutants could harm aquatic life. In this study, we investigated the effects of these contaminants on plants grown using hydroponics. Plants (Cherry tomatoes, Romaine lettuce, Basil) were grown by planting the seeds on a sponge soaked in water. About one week after these plants sprouted, these plants were subjected to preliminary contamination experiments using different concentrations of shampoo (10%, 30%, 50%) and dishwashing detergents (1%, 3%, 5%) to determine at which concentrations and changes such as in color. Observations after seven to ten days show that plants of all concentrations stop growing. Another experiment was done using lower concentrations of shampoo (10%, 15%, 20%). Lettuce with 15% and 20% shampoo became brown earlier than 10%. Therefore, to determine at which concentrations we need to do experiment with shampoo lower than 15%. Also, contaminated lettuce absorbed less water than control. Future investigation will focus on how these contaminated plants will affect aquatic and human lives.

11:30 – 11:40am

Claire Curtin (SUNY Oneonta)

Parasites of Redhorse Fishes

The group of researchers at the Biological Field Station with Dr. Florian Reyda has performed several fish collections in New York and West Virginia, gathering species of Redhorse fishes and their parasites. The focus of my project is on *Neoechinorhynchus* sp., a genus in the group of parasitic worms called the *Acanthocephala*. These worms are known for the hooks present on the anterior end of their body used for attachment to their host. The species descriptions that exist of this genus were written in 1949 and lack some information about the worms that can be obtained now due to technological advancements. With these older descriptions, I am working to determine the species of each *Neoechinorhynchus* worm we have collected from Redhorse fishes, and to either describe a possible new species or to redescribe the existing species by including images from scanning electron microscopy (SEM), images of the worms in a compound light microscope, as well as new measurements and characteristics of the worms thanks to these instruments.

11:40 – 11:50 am

Yuna Taki (TMU)

Effects of ultraviolet light on the growth of plants

In recent years, the depletion of the ozone layer has been a major environmental issue due to the excessive amounts of ultraviolet rays that penetrate our planet. The UV light causes harmful impacts to many living organisms on earth, such as plants. This study aims to determine the effect of the ultraviolet (UV) light to plants and observe how sunscreen (It's a commercial one) can eventually help to minimize the effect of the UV rays. Radish seeds were sown and grew in pots and irradiated with UV rays with sunscreen and without sunscreen. Growth was measured based on the elongation of apical meristems and leaves. Three days after sowing, plants grew at a height 3.0cm on average when irradiation was disrupted. However, when the irradiation was extended up to 1, 5, and 10mins, plants grew at the height of 2.7, 2.1, and 1.6cm, respectively, indicating there was a suppression of plants' growth as irradiation is increased. On the other hand, the growth of plants' apical meristems and leaves with sunscreen and extended UV irradiance of 60mins were significantly lower compared to without sunscreen, suggesting that the plants may have the ability to resist UV irradiation. However, the growth of plants with sunscreen but no irradiance was lower compared without sunscreen and no irradiance. From these, it is considered that sunscreen has ability to resist irradiance but also prevented the elongation of plants. The present investigation raised some questions on the materials of the sunscreen that may have hampered the plants' growth, which needs further studies.

11:50 am – 12:00 noon

Yuuka Hasegawa (TMU)

UV pattern of flower and its breeding method

Unlike humans, insects and birds can see ultraviolet (UV) light. These pollinators are attracted to flowers because of their colors and smells. Flowers contain UV-absorbing pigments that form a UV pattern that could attract pollinators. In the present investigation, we want to observe the UV pattern of the flower by taking an ultraviolet photograph and compare it with the actual visibility by using our naked eye. Photos of flowers were taken using a camera (Canon EOS, shutter speed 1/250, ISO 1600) equipped with a UV filter (HOYA 370nm) in sunlight and processed the picture with the photo application (ImageJ). The process is to separate RGB, extract blue component, adjust brightness and contrast. Results show that in petals, the parts that looked white appeared almost white even in the UV photograph, but in the center of the flower, the parts that actually looked white appeared black in the UV photograph. In addition, the petals were more likely to appear white in UV photography, and the center of the flower did not look very white. The petals appeared white in 36.8% of the materials, and the center of the flower appeared white in 7% of the materials suggesting that the petals reflect UV light easily and the center of the flower absorbs UV light easily.

Afternoon Session (5:00pm – 6:00pm):

5:00 – 5:10 pm
Welcome!

5:10 – 5:25 pm

Yuka Uchida (TMU)

Condition to change speed of cytoplasmic streaming

Cytoplasmic streaming is a phenomenon in which the plant organelles moved as carried by the myosin motor proteins. In the present study, we were interested in the activity of cytoplasmic streaming and how does light control it. The leaves of large waterweed, *Egeria densa*, were subjected to dark conditions and determined the number of cells undergoing cytoplasmic streaming when exposed to photic stimulation. Active cells increased after we subjected the leaves in two conditions (light and dark) for 30 minutes. However, streaming activity was significantly higher when the leaves were observed in the dark compared to the light. We would like to understand what are the factors (temperature, light, cutting response) affecting such differences in the cytoplasmic streaming and its relationship to photosynthesis.

5:25 – 5:35 pm

Brian Mullin (SUNY Oneonta)

Invasive Copepod Infections of Introduced Salmonids in Lake Ontario

Salmincola californiensis (Subclass Copepoda) parasitizes the gills of salmonids of the genus *Oncorhynchus*. Three species of *Oncorhynchus* salmon native to the Pacific Northwest, *Oncorhynchus mykiss* (rainbow trout), *Oncorhynchus tshawytscha* (chinook salmon), and *Oncorhynchus kisutch* (coho salmon) have been reported as hosts for *S. californiensis* since 1852. These three salmonids have been introduced to the Great Lakes intermittently since the mid 1800's. The introduction of these salmonids to the Great Lakes was followed, by the introduction of their parasitic gill copepod, *S. californiensis*. We chose to conduct a survey to formally document the occurrence of this invasive species. Our survey took place in 2018 and 2019 at the south-eastern side of Lake Ontario. Our survey results indicate the prevalence of *S. californiensis* to be 70% with a mean intensity of 2.71 in the 120 rainbow trout examined and a prevalence of 39% with an intensity of 1.56 in the 223 chinook salmon examined. *S. californiensis* was found on 1 of the 200 coho salmon examined. The prevalence of 70% in rainbow trout is of great concern considering that it is nearly double that of its native range, (35%). This work constitutes the first formal documentation of *S. californiensis* in Lake Ontario.

5:45 – 5:55 pm

Kanon Matsumoto (TMU)

Change of calcium oxalate from plants under various conditions

Cayratia japonica is a creeping plant belonging to the Family Vitaceae that developed an acrid smell. A study showed that *C. japonica* stores calcium oxalate stored in its body as needle-like crystals that causes acidity. The present study aimed to determine how much of the crystals were produced when the plant was subjected to different environmental conditions. We counted the number of crystals developed by this plant when subjected to different seasons, pH, temperatures, grinding methods, and adding more nutrients. Results showed that adding a basic or acidic chemical reduces production, grinding reduces the size of crystals, and they can be released quickly under high temperature. Crystal production increased when added with nutrients, and high production could be observed in autumn. In the future, we would like to isolate the crystals and find other methods to measure the relatedness of acridity to the amount of calcium oxalate production.

Poster presentations

Stephen Deforest (SUNY Oneonta)

Species Distribution Modeling of *Calopteryx maculata*

Species Distribution Models (SDMs) are becoming popular in conservation biology. When applied to a threatened or endangered species, they can help conservationists to predict what environments would be suitable for relocation and survival of the species. When applied to an invasive species, SDMs can help to predict where the organism is likely to spread next. SDMs can also be applied to species that are of least concern, simply to help researchers to further understand the life history and habitat preferences/tolerances of the organism. *Calopteryx maculata* is one such organism. *C. maculata* is a locally common species that occurs in/near lotic water systems and is a predator of many other invertebrates. Understanding this organism's behavior, requirements, and preferences can tell researchers more about the organism on which it feeds as well. Using data from the known distribution of *C. maculata* and performing surveys, I compiled a current distribution map via ArcGIS, and will be using R and Python to determine what environmental factors are influential in habitat suitability of *C. maculata*.

Eleanor Rettew (SUNY Oneonta)

Aquatic Macroinvertebrates in Previously Unsampled Tributaries Within the Susquehanna Watershed

Although aquatic insects are a useful tool for assessing the water quality of freshwater systems, there are currently a large number of streams within Otsego and Delaware counties for which there is no aquatic macroinvertebrate data. This dearth of information is particularly problematic now, when the biodiversity of freshwater streams is in crisis. This study was undertaken to gather data on the aquatic macroinvertebrates living in previously unsampled tributaries of the Susquehanna watershed. 14 previously unsampled streams within this watershed were visited within a 15-week period in the fall of 2019. Aquatic insects were collected from 8 of these sites and identified to taxonomic family. Of the 8 sampled sites, species richness was highest within Ouleout Creek, and lowest at the headwaters of Mill Creek. Across all sites, Hydropsychidae, Heptageniidae, and Ephemerellidae were the most commonly found macroinvertebrate families. Overall, while this study provides information necessary to begin building multiyear datasets on previously unsampled streams in upstate New York, more research will be needed to assess the health of these Susquehanna tributaries, and to determine the presence and abundance of aquatic invertebrates in these streams.