TMU – SUNY Oneonta Biology Symposium

Craven Lounge, Morris Conference Center, SUNY Oneonta

12:30 pm – 3:00 pm, February 17 (Fri), 2023

TOKYO METROPOLITAN UNIVERSITY
東京都立大学

SUNY ONEONTA

TMU - SUNY Oneonta Biology Symposium
Presentation schedule

February 17, 2023, 12:30 pm – 3:00 pm

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

Moderator: Kiyoko Yokota (SUNY Oneonta)

12:30-12:35 pm	Opening remarks
12:35-1:05 pm	Investigation of the peak time that moths visit flower at night. Tsubasa Yoshimura, Kazuto Akashi, and Ryoku Ito (Tokyo Metropolitan university)
1:05-1:15 pm	Production of wild-cultivated rice hybrids by in vitro fertilization. Satoka Ono (Tokyo Metropolitan university)
1:15-1:25 pm	Earthworms similar to known species. Hayato Endo (Tokyo Metropolitan university)
1:25-1:35 pm	A new species of *Neoechinorhynchus* (Acanthocephala) from two species of redhorse (Catostomidae: *Moxostoma erythrurum* and *Moxostoma macrolepidotum*) in North America. Morgan Fleming and Emily Bulmer (SUNY Oneonta)
1:35-1:45 pm	Development for application to optogenetics based on cyanobacteriochrome by circular permutation. Manaka Hasebe (Tokyo Metropolitan University)
1:45-1:55 pm	Detrimental effects of blue light on flies. Akiharu Fukuda (Tokyo Metropolitan University)
1:55-2:05 pm	Aquatic plant sampling and application of data. Jessica Casey (SUNY Oneonta)
2:05-2:15 pm	The classification of mushrooms. Kanami Nozawa (Tokyo Metropolitan University)
2:15-2:25 pm	Rice breeding. Mizuki Takasawa (Tokyo Metropolitan University)
2:25-2:35 pm	Comparison of invasive mussels in Otsego Lake, NY. Madelynn Ackley (SUNY Oneonta)
2:35-2:45 pm	Pollinators in Ogasawara Islands. Sakurako Kimura (Tokyo Metropolitan University)
2:45-3:00 pm	Additional Q&A and closing remarks

Presentation abstracts

All presenters are undergraduate researchers unless otherwise noted.

12:35-1:05 pm

Tsubasa Yoshimura, Kazuto Akashi, & Ryoku Ito (Tokyo Metropolitan University)

Investigation of the peak time that moths visit flower at night

By researching the time of day when moths come to the flowers at night to suck nectar, we investigated whether there is a peak time of day when they visit the flowers. The research method involved placing a camera in front of the flowers and automatically taking pictures every two minutes. The results showed that there was a high probability that there was a peak time of day for some species.

1:05-1:15 pm

Satoka Ono (Tokyo Metropolitan University)

Production of wild-cultivated rice hybrids by in vitro fertilization

Wild rice *Oryza* sp. are known to possess useful traits for rice improvement, such as resistance to insects and diseases. Thus, various important traits of wild rice have been transferred to cultivated rice via breeding. Interspecific hybrids between cultivated rice (AA genome) and wild species (AA genome) were produced by artificial pollination. However, Intergeneric hybrids between cultivated rice (AA genome) and wild species (non-A genome) are completely sterile due to failure in embryo development. In this study, fertile hybrids between cultivated rice (AA) and wild species, *O.officinalis* (CC) were successfully produced by using in vitro fertilization (IVF) system, suggesting that, employing IVF system, pre- and post-fertilization barriers can be overcome. We also produced hybrids between cultivated rice (AA) and wild species, *O.rufipogon* (AA) as a control. IVF system involves a combination of three basic microtechniques: isolation of male and female gametes, electrofusion of the gametes to produce zygotes, culture and regeneration of zygotes. Notably, genome doubling was frequently detected in developing zygotes produced by this method. Hybrid zygotes derived from cultivated rice egg (AA) and *O.rufipogon* sperm (AA) cells were able to regenerate into plantlets. However, hybrids between cultivated rice egg (AA) and *O.officinalis* sperm (CC) cells ceased the development at the two-cell embryo stage. Interestingly, the development arrest of the hybrids could be abrogated by reciprocal fusion of gametes, resulting in fertile inter-AC hybrids. Ploidy levels in the hybrids were also determined and found that several plants were tetraploid. Analyses of genomes and phenotypes are now on-going.

1:15-1:25 pm

Hayato Endo (Tokyo Metropolitan University)

Earthworms similar to known species

Earthworms are familiar creatures in our lives and are found in many parts of the earth. For example, they are distributed in a variety of habitats, from the soil we usually see them in to permafrost, oceans, and freshwater. They also support many ecosystems, and our lives benefit from these supported ecosystems in many ways. Soil grows better plants and creates richer ecosystems when earthworms are present, and as one of the 17 goals of the SDGs states in "Create richer soil" it is important to create richer soil for the future of our planet. And as you know, earthworms are essential to the realization of this goal. For this reason, an understanding of earthworms is essential. However, Megascoolecidae, the most widely distributed group of earthworms in Japan, has lagged behind in even basic taxonomic research. There are many reasons for this. The most significant barrier is intraspecific morphological variation. This intraspecific variation has confused many earthworm taxonomists as to whether they are homologous or heterologous. However, with the recent development of molecular biological techniques , this is gradually being clarified, though is still incomplete. My research considers whether earthworms that are morphologically similar to

known species are undescribed species by evaluating them from two perspectives: morphological and molecular biological taxonomy.

1:25-1:35 pm

Morgan Fleming and **Emily Bulmer (SUNY Oneonta)**

A new species of *Neoechinorhynchus* (Acanthocephala) from two species of redhorse (Catostomidae: *Moxostoma erythrurum* and *Moxostoma macrolepidotum*) in North America

We encountered a new species of *Neoechinorhynchus* (Acanthocephala) during survey work in North America that focused on catostomid fishes (suckers). Among our samples of *Moxostoma* specimens from the Red River in Manitoba, Canada, the Kanawha River in West Virginia, and the Allegheny River in Pennsylvania we encountered specimens of genus *Neoechinorhynchus* inconsistent with previously known species. All fish were captured via boat electroshocking, and examined with a dissecting microscope for parasitic worms. All acanthocephalans were stored in ethanol and vials and then stained and mounted onto slides with Canada Balsam and subsequently examined with a microscope. Measurements of >10 male and >10 female specimens of this new species were then compared to available published data for other North America species of *Neoechinorhynchus*. This new species differs from all but six of the 30+ species of *Neoechinorhynchus* from the USA and Canada in its possession of body walls that are thicker dorsally than ventrally, and in having lemnisci that are markedly unequal in length. Although the new species is similar to *N. buckneri, N. bullocki, N. carinatus, N. cristatus, N. prolixoides, and N. prolixus* in terms of body wall thickness and lemnisci, it differs via hook lengths of anterior, middle, and posterior hooks on the proboscis. Our morphologically-based conclusion that that this species is distinct from each of those 6 species is corroborated by sequence data for the large ribosomal subunit obtained by collaborators. Our study calls attention to the potential for more discovery of novel species in North America.

1:35-1:45 pm

Manaka Hasebe (Tokyo Metropolitan University)

Development for application to optogenetics based on cyanobacteriochrome by circular permutation

This work is to develop an application for optogenetics by using cyanobacteria's photoreceptors. Cyanobacteriochromes (CBCRs) are photoreceptors derived from cyanobacteria. CBCRs are various molecules that sense a wide range of light qualities from UV to far-red light. Almost of CBCRs bind to phycocyanobilin (PCB), a liner tetrapyrrole chromophore. But we have developed a modification that binds to Biliverdin (BV). CBCRs binding to BV is suitable for application to optogenetics. Because they efficiently incorporate BV which is a mammalian intrinsic chromophore. Also, they absorb the far-red light which facilitates deeper penetration into tissues while causing only low levels of damage. In this study, we succeeded in developing a variety of circular permutations in which the N terminal and C terminal are located near chromophore pockets to develop for application to optogenetics based on BV-binding CBCRs. As a result, we succeeded in circular permutants which can both bind BV and photo conversion. Now, we verify the availability of optogenetics tools.

1:45-1:55 pm

Akiharu Fukuda (Tokyo Metropolitan University)

Detrimental effects of blue light on flies

According to the existing thesis, it is proved that blue light shortens the life span of flies. Therefore, it was black and white that blue light is harmful to the species before I started my own experiment. I wondered if learning behavior is inhibited by blue light exposure because neurodegeneration was one of the discoveries from the dead flies. When we memorize something, neurons play a significant role; hence, I wanted to examine how much blue light irradiation affects the learning behavior of flies: *Drosophila* melanogaster. However, I found out that it takes ages for an undergraduate student to conduct the experiment since it is complicated. As a substitution, I decided to gauge the climbing assay of the flies. I would like to shed blue light on flies with different intensities and time lengths so that I can figure out how much exposure is harmful. Before visiting SUNY, I would work on it and may be able to talk about bits and pieces of the results that I expect to gain until then.

1:55-2:05 pm

Jessica Casey (SUNY Oneonta) (graduate student)

Aquatic Plant Sampling & Application of Data

Point Intercept Rake Toss Relative Abundance Method (PIRTRAM) is a widely used method for assessing presence and absence of plant species and biomass estimations. In the summer of 2022, a crew of graduate students completed a full PIRTRAM survey on Chautauqua Lake, located in western New York, following many years of PIRTRAM surveys completed by Racine-Johnson Aquatic Ecologists. Data applications range depending on stakeholder concerns but can vary from full macrophyte community progression to individual species progression within a lake. Data that is publicly available was also used in order to look at long-term trends of individual species within different basins in Chautauqua Lake.

2:05-2:15 pm

Kanami Nozawa (Tokyo Metropolitan University)

The classification of mushrooms

Speaking of mushrooms, we often eat mushrooms but there are also mushrooms in the fields around the world. Wild mushrooms play an important role in forests. However, we still don't know a lot about mushrooms. We have many unrecognized species in the fields. The classification of mushrooms had been based on morphological features. However, it is not sufficient to classify mushroom taxa because mushrooms have few morphological characteristics. When mushrooms are classified based on reproductive isolation, it is possible to recognize cryptic species.
In my research, I focus on ectomycorrhizal fungi among mushrooms. The targets are *Lactifluus lignyotus, Tylopilus virens* and *Amanita vaginata*. Ectomycorrhizal fungi are mushrooms that live in a symbiotic relationship with host plant roots. I will identify their cryptic species using molecular analysis. I collected my target mushrooms in the field last summer and I performed a DNA experiment and morphological observations. Also, I will try to clarify differences of morphological characteristics and host plants in the future.

2:15-2:25 pm

Mizuki Takasawa (Tokyo Metropolitan University)

Rice breeding

Rice and bread wheat are members of the same family, but they are separated by a subfamily. It is impossible to create hybrids through normal hybridization. Recently, Tokyo Metropolitan University succeeded in producing a hybrid plant of rice and bread wheat (Oryzawheat) using the IVF (in vitro fertilization) system. In 2022, a number of rice-wheat lines were grown in the field of the Arid Land Research Center and agronomic traits were investigated at Tottori University. As a result, it was confirmed that some lines of rice-wheat showed different traits from wheat, and that there were also differences among lines. These rice-wheat seeds were used to investigate useful traits for the development of environmentally stress tolerant crops that can withstand recent global warming and extreme weather events.

2:25-2:35 pm

Madelynn Ackley (SUNY Oneonta)

Comparison of Invasive Mussels in Otsego Lake, NY

Invasive mussels in Otsego Lake, NY, Quagga mussels (*Dreissena bugensis*) and Zebra mussels (*Dreissena polymorpha*), were collected from the lake. These mussels disrupt the lake ecosystem and are a major factor to cause harmful algae blooms on the lake. This study was conducted to evaluate the survival and development of the quagga and zebra mussels. To do this the mussels were collected and then brought back to the lab to be identified, sized, and aged. The data will then be used to determine if one of the species is outcompeting the other species within the lake.

2:35-2:45 pm

Sakurako Kimura (Tokyo Metropolitan University)

Pollinators in Ogasawara islands

Ogasawara islands are oceanic islands located about 1000 km south of the Japanese mainland and have never connected to large landmass. Flora of the Ogasawara islands have been greatly affected by invasive species. The pollination system also has been changed by invasive predator. In Ogasawara islands, diurnal visitors have been decreasing by predation of invasive diurnal lizard. On the other hands, nocturnal visitors might be not affected by the lizard. Thus, focusing on nocturnal flower visitors is needed to know the pollination system in Ogasawara islands. Also, the interval shooting function of the digital camera is useful for the research of nocturnal flower visitors. In my research, I observed flower visitors coming to widely distributed plants or endemic plants in Ogasawara islands by using interval shooting function. This presentation will report the result of the data in last summer and autumn.