# NW European IUSSI Newsletter: November 2020

## LAST DAY TODAY TO REGISTER for the NWE IUSSI Winter Meeting

Today (30th of November) is the last day to register for the NWE IUSSI Winter meeting!

There are more than 100 attendees already, and we hope that as many PIs as possible will attend, so that students and early career researchers can benefit from extending their network and reaching out to PIs on Slack.


## Tales from the lab: Jonathan Shik

***Nature's ancient farmers***

The busy highways of leafcutter ant foragers in the genus *Atta* are among the most dramatic scenes in rainforests of the new world tropics, with thousands of foragers cutting vegetation from tree tops and carrying tiny plant fragments back to the nest. Leafcutter ants are expert farmers, converting this vegetation into a nutritional and enzyme-rich mulch used to provision a domesticated fungal cultivar within massive subterranean nests. In a new study published in Nature Ecology & Evolution (Shik et al. 2020), we studied whether and how these ant farmers select provisioned nutrients that meet the specific nutritional needs of their fungal cultivar.

Leafcutter ants are the crown group of a monophyletic 'attine' ant lineage that emerged ca. 60 million years ago and there now exists diverse agricultural practices among >250 fungus-farming ant species. Most attine species are thus not leafcutters, and instead maintain small-scale farming systems with tens to hundreds of monomorphic workers producing fungi with detritus (e.g. bits of insect frass, decaying bits of wood and plant material) scavenged from the leaf litter. We thus also explored the nutritional provisioning and yield challenges that these farming ants overcame as they domesticated their fungal crops over millions of years.

Results of our study highlight a tradeoff between cultivar yield and vulnerability. Specifically, as ant farming systems evolved, their fungal crops came to provide higher-quality nutritional rewards (e.g. swollen hyphal tips called gongylidia), but came to increasingly depending on narrow blends of provisioned nutrients. This study summarizes a variety of lab-based and field-based research approaches performed by myself and 10 co-authors, including Jacobus Boomsma and William Wcislo, over the past 7 years at the University of Copenhagen (UCPH) in Denmark and at the Smithsonian Tropical Research Institute (STRI) in Panama.

Fascinatingly, at our field sites in Panama, all of the evolutionary stages of fungus-crop domestication can be found in a single 20-m2 plot of tropical forest leaf litter. We thus began the project by simply watching these ants forage for over 100 hours, lying on trash bags on the rainforest floor next to attine nest entrances. Whenever a tiny ant to returned to her nest laden with a bit of caterpillar frass, we'd carefully grab it and send her on her way. By nutritionally analyzing these substrates, we could quantify the 'realized nutritional niches' targeted by ant foragers.

We then isolated fungi from many attine colonies onto petri dishes, and performed a series of nutritional experiments to define each cultivar's intrinsic 'fundamental nutritional niche' as the specific protein and carbohydrate blend that maximizes its growth performance . By comparing these realized and fundamental niches, we could then test how various attine species targeted their crops' nutritional needs.

We further showed that populations of individual attine species can cultivate several different fungal cultivars at small spatial scales with different nutritional needs. And, while each colony farms one cultivar in monoculture, there are likely many new discoveries to be had about how these ants can detect the specific nutritional needs of their cultivar, and how they can navigate their local environment to target the specifically required nutrients.

Reference: Shik, J.Z., Kooij, P.W., Donoso, D.A., et al. 2020. Nutritional niches reveal fundamental domestication tradeoffs in fungus-farming ants. *Nature Ecology and Evolution doi:* https://doi.org/10.1038/s41559-020-01314-x

For more information about this study and other research performed in my lab, visit www.jonathanshik.com.

**Jonathan Shik, Assistant Professor at the University of Copenhagen & Research Associate at the Smithsonian Tropical Research Institute**

*1 - Jonathan Shik watches leaf cutter ants march back to their nest, carrying leaf pieces to fertilize their underground fungus garden (Image credit: Sean Mattson)*

*2 - Image credit: Alex Wild (https://www.alexanderwild.com/Ants)*

*3 - Image credit: Alex Wild (https://www.alexanderwild.com/Ants)*

# The NWE IUSSI Twitter account

The NW IUSSI Twitter account already has more than 250 followers, which is a great step in order to increase the number of people we reach with news and achievements of our society. The aim is to use this platform to communicate events, recent publications and news from the society to a wider audience.

As this is still the beginning:

1) If you are a Twitter user, please follow us so that we can follow you back. This will allow us to re-post your research/outreach activities as the society. You can also tag us in your posts if you want us to see it our handle is @IUSSI_NWES

2) Whether you use Twitter or not, please feel free to send us material (such as an event or a recent publication related to social insects) you would like to see posted on Twitter. To do this please email the social media team iussi.nwes.socialmedia@gmail.com.

# How to become a NWE IUSSI member

Having a subscription to IUSSI is a great way to support the world of social insect research. Membership is cheap (£7.50 for students, £15 for full members). One additional perk of being a member is that it provides large discounts when registering for IUSSI conferences. Registrations can be done here: http://www.iussi.org/NWEurope/subs.htm .

## Current job opportunities

**Current vacancies on the section web site:** http://www.iussi.org/NWEurope/vacancies.htm**:**

Do you have Ph.D. or Postdoc positions coming up? Email nbos [at] bio.ku.dk and we will add them to the newsletter. We also run the INSECTSmail mailing list, which distributes information about job and studentship opportunities, meetings, courses, and calls for information about social insects. See more on the section website: http://www.iussi.org/NWEurope/INSECTSmail.htm and send any information to be included (or subscription requests) to INSECTS [at] bio.ku.dk.

## Looking for pictures!

The pictures in this newsletter were contributed by both Nick Bos, as well as Quentin Willot from Stellenbosch University, who kindly allowed us to choose freely from his portfolio. Have a look at his great work here: https://www.picuki.com/profile/qwilltn

If you have pretty pictures to share, please send a link to nbos [at] bio.ku.dk and they might just be used for the next newsletter. Credits will be given of course!

## Questions? Contact Us!

If you have any questions, comments or suggestions, please mail to nbos [at] bio.ku.dk.