

Contribution ID: 227

Type: **Oral Presentation**

## **Adaptive partner recruitment by hosts can help maintain a diversity in mutualistic systems**

*Wednesday, 11 July 2018 15:40 (20 minutes)*

Mutualisms are reciprocally beneficial interactions between heterospecific organisms. Theoretical studies have predicted that genetic diversity in mutualistic systems should decrease over time because of innate positive feedback structure of the interaction. Negative feedback due to asymmetry in the exchange of benefits can maintain the diversity and stabilize multi-strain mutualistic systems, but partner preference for more beneficial partners might reduce such asymmetry and strengthen the positive feedback. Here I develop a replicator dynamics model for a mutualistic system between two host and two symbiont strains to clarify conditions that can stabilize multi-strain mutualisms in which the positive interspecies feedback is dominant. I assume that one symbiont strain is mutualistic for one host strain but parasitic for the other, whereas the other symbiont strain is the opposite. Hosts choose multiple symbiont individuals from the environment and discriminately offer them resources (e.g. photosynthates in legume–rhizobium mutualisms), and only mutualistic symbionts spend a fraction of the resources on producing beneficial products for their hosts (e.g. nitrogen fixation by rhizobium). The fitness of a host is proportional to the product of the amount of remaining resources and that of receiving beneficial products, while the fitness of a symbiont is proportional to the amount of the rest of resources offered by its host. I assume that proportions of resources to spend for hosts are different between the two symbionts, and values of other parameters including the partner preference are identical between the two mutualistic associations of the hosts and symbionts.

I show that two host and symbiont strains can coexist stably under strong partner preference by hosts if hosts adaptively adjust the number of associating symbionts, even when the intra-strain competition among hosts is not strong enough for coexistence of the strains by itself. They can also coexist under weak partner preference. However, under moderate partner preference the coexistent equilibrium is dissolved and the strains cannot coexist.

**Primary author:** EZOE, Hideo (Osaka Prefecture University)

**Presenter:** EZOE, Hideo (Osaka Prefecture University)

**Session Classification:** Ecology, food webs, coexistence

**Track Classification:** Ecology