Novel Subtle Acoustic Communication: Successful Elucidation of the Cryptic Ecology of Runner Plant Bugs (Hallodapus spp.) with Emphasis on Their Stridulatory Mechanisms

Tamada, Yui (School: Nagasaki Prefectural Nagasaki Nishi High School)
Miyazaki, Ayana (School: Nagasaki Prefectural Nagasaki Nishi High School)
Hinami, Haruka (School: Nagasaki Prefectural Nagasaki Nishi High School)

Due to having a cryptic habitat, very little is known about the life history characteristics and stridulatory devices found in runner plant bugs (Hallodapus spp.) and several other members belonging to the tribe Hallodapini in the plant bug family Miridae (Heteroptera). In order to demonstrate stridulation in these bugs, we established new methods for capturing sufficient specimens and developed a unique system for recording the faint noises that they produce. Specifically, we carefully observed specimens, examined the microstructure of their stridulatory devices, and recorded their stridulations. We successfully demonstrated the following: 1) the stridulatory device, which comprises the forewing edge and dorsal metafemur, is used for intraspecific communication (at least for courtship); 2) an engine-vacuum-net is the safest and the most effective sampling method for capturing many epigeic targets; 3) the unique life cycle, behavior (including an enigmatic intraspecific conflict), immature forms, and feeding habits within the Miridae is documented for the first time; 4) the morphology of the stridulatory device is described after examination by scanning electron microscopy, and reliable hypotheses are proposed regarding how these could be used to infer phylogeny and construct a robust classification for runner plant bugs. Further, a method for rearing and maintaining all of the developmental stages of runner plant bugs is established. Initial results show that our synthetic diet is more effective than the conventional diets used to mass-produce biocontrol agents, which will facilitate a reduction in the use of chemical pesticides and promote environmentally friendly pest management.

Awards Won:
Fourth Award of $500
Acoustical Society of America: First Award of $1,500, plus students School will be awarded $200, and Mentor awarded $500.