Discovery of new species of soldier beetles in Taiwan

NTU entomologists collaborate with Japanese natural history museum on the taxonomy of Cantharidae (soldier beetles)

Comprehensive taxonomic studies are fundamental to biology. They provide accurate identification of materials, which is directly related to the conclusions that can be drawn from results. According to the online database of the Taiwan Catalogue of Life, there are over 20,000 species of insects recorded in Taiwan. Among this large group, the members of Coleoptera, also known as beetles, are the most speciose group and comprise the largest proportion of newly described animals each year.

Beetles belonging to the family Cantharidae, also known as soldier beetles, are small to middle-sized terrestrial beetles occurring on all the habitable continents, with over 5,000 named species and more new taxa waiting for description. Cantharids are characterized by elongated, soft and colorful bodies, are often found in forests and are usually observed visiting flowers. Cantharids are opportunistic predators of invertebrates and also feed on nectar or pollen.

In January 2016, in collaboration with the Japanese entomologist Dr. Yûichi Okushima from the Kurashiki Museum of Natural History, Professor Chiun-Cheng Ko and colleagues from the Department of Entomology published a study in the European Journal of Taxonomy. Prof. Ko

Lycocerus yitingi

Lycocerus evangelium

Lycocerus kintaroi

Lycocerus aurantiacus

supervised his undergraduate intern Yun Hsiao, working on his MOST College Student Research Project on the taxonomy of the *Lycocerus hanatanii* species group (Coleoptera, Cantharidae) from Taiwan.

The team examined over 500 specimens from museum collections in Taiwan, Japan, UK, USA, France, Switzerland and Germany. They discovered four species new to science. One of the new species, *Lycocerus evangelium*, was named for the auspicious circumstances surrounding its discovery: evangelium means "good news" in Latin. The other three new soldier beetles are *L. yitingi, L. kintaroi,* and *L. aurantiacus. L. yitingi* and *L. kintaroi* are named after their collectors, Mr. Yi-Ting Chung and the late Dr. Kintaro Baba, respectively, and *L. aurantiacus* is named for its orange-fringed pronotum.

Global biodiversity currently faces a variety of difficulties, and many species become extinct before they are described. The discovery of new species reminds us that there are still many unknown creatures in Taiwan waiting for discovery and that we should protect our precious homeland and environment.

Reference
Yun Hsiao, Yûichi Okushima, Ping-Shih Yang, Chiun-Cheng Ko. (2016). Taxonomic revision of the *Lycocerus hanatanii* species group (Coleoptera, Cantharidae), with the description of new species from Taiwan. *European Journal of Taxonomy*, 170, 1-33. DOI: 10.5852/ejt.2016.170.

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A flip of longevity with neurons

All forms of life, from those that live in the icy water of the Arctic Circle to those inhabiting the boiling hot sands of the Kalahari Desert, share one thing in common: their physiology and longevity are affected by environmental temperature. One might assume that this is simply a thermodynamic process, in which temperature alters the rates of biochemical reactions and thus establishes how quickly cells or tissues age. However, studies in a simple roundworm, *Caenorhabditis elegans*, and in mice suggest that it is the nervous system that regulates the effects of temperature on longevity. Chun-Liang Pan's group at the Institute of Molecular Medicine, NTU, recently identified key neuronal signals from *C. elegans* neurons that counteract the adverse effects of high temperature on life span.

Yen-Chih Chen and Hung-Jhen Chen, two Master's program students at the time of the study, found that AFD thermosensory neurons in *C. elegans* relay temperature information through phosphorylation of CRH-1/CREB, a transcription factor well known for its importance in neuronal memory. Formation of this putative "temperature memory" in AFD neurons leads to the synthesis of FLP-6, a short peptide, the release of which from thermosensory neurons is stimulated by a rise in temperature. Loss of CRH-1 or FLP-6 shortens lifespan, and, strikingly, an increase in CRH-1 or FLP-6 activity extends longevity at a warm temperature. Thus, modulation of a single gene overrides the unwanted aging effects resulting from a high environmental temperature.

However, thermosensory neurons do not act alone. Data suggest that the FLP-6 peptide targets AIY interneurons, which communicate with AFD neurons via chemical signals. How do a total of four neurons (two AFDs and two AIYs) globally alter the speed at which an animal ages? By profiling gene expression patterns using high-throughput messenger RNA sequencing, the Pan group found that signals from the AFD-AIY neural circuit dampen the activity of INS-7, an insulin-like peptide, as well as other genes that also engage insulin-related pathways. As activity of the insulin signaling pathway