Body Temperature Regulation of Drone Beetles in Flight as Revealed by Remote Measurement of their Body Temperatures

Kuriya, Taishi
Kazama, Kiryu
Takami, Yusuke

Insects are known to be able to warm their bodies endogenously and to regulate their body temperatures by themselves. However precise mechanisms of their body temperature regulations are not clear mainly due to difficulties in detecting true body temperatures during actual flight. In this experiment, we developed a convenient method of measuring the inner body temperature of drone beetles during flight and succeeded in detecting precise changes of their body temperatures before, during and after flight. Adult beetles of Protaetia orientalis submarmorea were reared in laboratory from eggs under controlled conditions. Each bug was placed in an elaborately constructed flying apparatus and its body temperature was measured continuously during flying at the abdomen of the thoracic segment using the ultrared thermographic camera. It was found that when the air temperature was over 27.5?, bugs maintained their body temperatures at around 37? during flight. When the air temperature was over 27.5 to 37?, bugs warmed themselves by frequently pulsating their abdomens up and down, while the air was over 37?, they cooled their bodies by actively pulsating their abdominal segments to and fro. When the air was below 27.5?, their body temperatures were gradually lowered and bugs soon ceased flying. We succeeded in measuring actual body temperatures of flying adult beetles of Protaetia orientalis submarmore and gave valid evidences to seasonal and regional emergences of adult beetles of this species.

Awards Won: