

Estimating the Natal Sites of Clearwing Moths by using Trace Elements and the Invasive Pattern of Currant Clearwing Moth

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Some species of clearwing moths (Lepidoptera: Sesiidae) are known as destructive pests. For example, *Glossosphecia romanovi* is a pest of a grape tree. *Sesia yezoensis* is also observed in the same area as the previous species, but it is not a pest because its host plants are not fruit trees but willows. The currant clearwing moth *Synanthedon tipuliformis* has known as a pest of red and black currants. It was originally confined to Europe, but was introduced to Australia, New Zealand, USA and Japan along with the spread of the currant cultivation. In Japan, this species was firstly recorded from Hokkaido Island in 2008 and also found in the northern and central parts of Honshu Island within a few years. We estimated their natal sites using the elements in their bodies as tracers and evaluated their adult dispersal patterns. These are important information for the pest control and preventing to spread the invasive species.

By using ICP-MS (Agilent, 7500cx), levels of various trace elements were determined in bodies of clearwing moths (*Glossosphecia romanovi*, *Sesia yezoensis* and *Synanthedon tipuliformis*) collected from Aomori and Akita Prefectures in northern Japan.

The 4 element (Ni, Zn, Sn, and Pb) levels of *G. romanovi* in the vineyards were markedly higher than those in the non-vineyard areas, and the two groups could be clearly discriminated by these element levels. These elements might be introduced by the past and/or present agricultural managements, the exhaust gas of vehicles, and so on. Moreover, we could estimate their natal sites locally by multiple statistical analysis, and an individual which had apparently migrated from the non-vineyard area to the vineyard were detected. However, in the case of *S. yezoensis*, the differences between their natal sites were indistinct. This was probably because the host plants of this species were various willows (family Salicaceae). The differences between their natal sites might be masked with the differences between plants on which they had fed. These results suggested that the discrimination method using the trace elements were used effectively for stenophagous species such as *G. romanovi* rather than euryphagous species.

We could also discriminate between the currant clearwing moths in the each sampling sites by using the trace elements. Then, there might be no individual which had immigrated from another sites in spite of the short distances between the sampling sites (about 1.4 - 2.7 km). Therefore, it was considered that this species did not have high dispersal potential and the rapid invasion was caused by artificial import of its larvae with currant trees.

Keywords: migration, invasive species, clearwing moth, heavy metal, ICP-MS