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Respiration-based monitoring of metabolic rate following cold-exposure in two invasive Anoplophora species (Cerambycidae) depending on acclimation regime

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Asian and Citrus longhorned beetles *Anoplophora glabripennis* (ALB) and *A. chinensis* (CLB) respectively, are two closely related xylophagous invasive species whose native ranges overlap in Eastern Asia. Although both species are capable to develop in a wide range of hosts in their invaded areas, their invasion patterns differ. Introduction pathway is usually wood packaging for ALB but plants for planting for CLB. ALB shows numerous outbreaks remaining localized in urban areas in North-East America and Western Europe, whereas CLB is presently restricted to the Mediterranean area but spreading in natural areas. Temperature is pivotal in setting distribution limits of ectotherms, and limiting low temperatures may most likely be encountered by overwintering larvae of ALB and CLB. To investigate whether differential cold tolerance can contribute to setting the limits of both species' invaded ranges, we monitored larval metabolic rate before and after exposure to a one-week moderate cold stress assumed to be ecologically relevant in their European range (-2/+2 ◦C, 14/10 hours). We tested two distinctive fluctuating acclimation regimes before the cold exposure to check whether larval thermal experience prior to introduction events could alter the invasive success in new areas. Survival was high in all conditions for both species. While visual examination showed temporary locomotor and feeding inactivity during the stress, we found no clear evidence of altered respiration rate when comparing pre-stress and post-stress measurements, suggesting that larvae could immediately resume their initial metabolic activity after the stress, regardless of the acclimation regime. These results tend to indicate similar tolerances to the moderate stress considered for both species, but further studies on prolonged and more acute stresses are mandatory to address whether putative differential cold tolerance contribute to their distinctive spread patterns. Assessing respective propagule pressures through their introduction pathways is also required to understand their different invasion dynamics.

Keywords: ALB, CLB, Anoplophora, acclimation, invasive species, respirometry, cold stress

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