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▶ **To cite this version:**

Christelle Robinet, Charles Edouard Imbert, Jérôme Rousselet, Daniel Sauvard, Jacques Garcia, et al.. Transplanting large potted trees: a factor involved in the range expansion of the pine processionary moth, Thaumetopoea pityocampa.. 24. International Congress of Entomology, New Era in entomology, Jun 2012, Daegu, South Korea. 1 p., 2012. hal-02806488

HAL Id: hal-02806488
https://hal.inrae.fr/hal-02806488

Submitted on 6 Jun 2020

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XXIV International Congress of Entomology
'New Era in Entomology'
August 19-25, 2012 | Daegu, Korea
ICE2012

PS3M265

Ecology

P3

Transplanting large potted trees: a factor involved in the range expansion of the pine processionary moth, *Thaumetopoea pityocampa*.

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Pine processionary moth, Thaumetopoea pityocampa, is expanding its range northwards and upwards in response to climate warming. The natural spread in latitude was estimated at ca 5.6 km per year during the last 10 years in the southern Paris Basin. However, additional pioneer colonies were recently detected far from the northern edge of the range, and notably near downtown Paris. A study combining several approaches was conducted to determine the origin of these pioneer colonies First, the shortest distance between the pioneer colonies and the previously- infested locations was calculated, and this distance was compared to the female flight distance measured on a flight mill. We found that most of pioneer colonies could not result from natural dispersal. Then, some individuals from the pioneer colonies were genotyped and compared to populations of different areas in France and neighbouring countries. We found that several pioneer colonies had higher probabilities to originate from the southern Mediterranean area than from the northern edge, suggesting a dispersal at very long distance and accidental human transportation. Finally, the presence of natural enemies associated with different life stages of the pine processionary moth was assessed. We found a parasitoid species specific of pine processionary pupae indicating that this natural enemy was probably transported along with moth pupae. These convergent results suggest that pioneer colonies may result from the transportation of large potted trees including pupae in the accompanying soil. Consequently, both global warming and human-mediated dispersal are involved in the range expansion of this insect.

Keywords:*range expansion, climate change, pine processionary moth, Thaumetopoea pityocampa, human-mediated dispersal*

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