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► **To cite this version:**

David C Lees, Walter H Lack, Rodolphe Rougerie, Antonio Hernandez-Lopez, Thomas Raus, et al.. Tracking origins of the highly invasive horse-chestnut leafminer using herbaria and minibarcodes. 7. European Conference on Biological Invasions NEOBIOTA, Sep 2012, Pontevedra, Spain. , 1p., 2012. hal-02744907

HAL Id: hal-02744907

<https://hal.inrae.fr/hal-02744907>

Submitted on 3 Jun 2020

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Tracking origins of the highly invasive horse-chestnut leafminer using herbaria and minibarcodes

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Determining the origin of alien invasive species is crucial to developing invasive species management strategies (Roques *et al.* 2011). However, the origin of many alien species remains uncertain because of the lack of historical data. For instance, the moth *Cameraria ohridella* (Gracillariidae) was described in 1986, as a genus new to Europe and had managed to invade almost all Europe since 1989. Its larvae are leaf miners on the white flowering horse-chestnut (*Aesculus hippocastanum*), causing significant damage to their summer foliage. The fact that the appearance of *C. ohridella* in much of Western Europe has been so recent and dramatic, without earlier detection by entomologists, has made its origin a subject of debate (Lees *et al.* 2011a). Originally thought to be a relict species in the Balkans, a more recent hypothesis is that the moth is an example of a sudden host plant shift to horse-chestnut, probably from maple or sycamore (*Acer spp.*), maybe combined with long distance translocation. Examination of horse-chestnut samples in seven historic herbarium collections revealed that almost half of 71 sheets had leaf mines with larvae/pupae inside. This material came from natural populations in Albania and Greece and dated from 1981 back to 1879.

We extracted DNA from 54 archival larvae and used five COI minibarcode primer pairs developed specifically for *C. ohridella*. We successfully amplified DNA minibarcode fragments from 10 larvae extracted from herbarium specimens from 1936 to 1981. These archival sequences confirm an identity and Balkan origin for *C. ohridella* and the herbarium data set its history back by over a century. The herbaria reveal three previously unknown mitochondrial haplotypes. We also detected local outbreaks back to 1961 and dynamic frequency changes, which may be associated with road development (Lees *et al.* 2011). In particular, comparison with a temporal series of herbarium samples (1936, 1974 and 1981) with a modern sample from Karitsa in E. Greece suggests the frequency of the invasive haplotype A has been increasing rapidly even within the Balkans. This case history demonstrates that herbaria are greatly underutilised in studies of invasive species origins, herbivore biodiversity and insect-plant interactions.

References

- Lees D, Lopez-Vaamonde C, Augustin S (2011a). Taxon page for *Cameraria ohridella* Deschka & Dimic 1986. In: EOLspecies, <http://eolspecies.lifedesks.org/pages/8675>.
- Lees D, Lack HW, Rougerie R, Hernandez A, Raus T, Avtzis ND, Augustin S, Lopez-Vaamonde C (2011b) Tracking origins of invasive herbivores using herbaria and archival DNA: the case of the horse-chestnut leafminer. *Frontiers in Ecology and the Environment* 9: 322-328
- Roques A, Kenis M, Lees D, Lopez-Vaamonde C, Rabitsch W, Rasplus J-Y, Roy D, (Eds) (2010) *Alien Terrestrial Arthropods of Europe*, volumes 1 and 2 [BioRisk 4 (Special Issue)]. 1028 pp. Pensoft Publishers, Sofia.