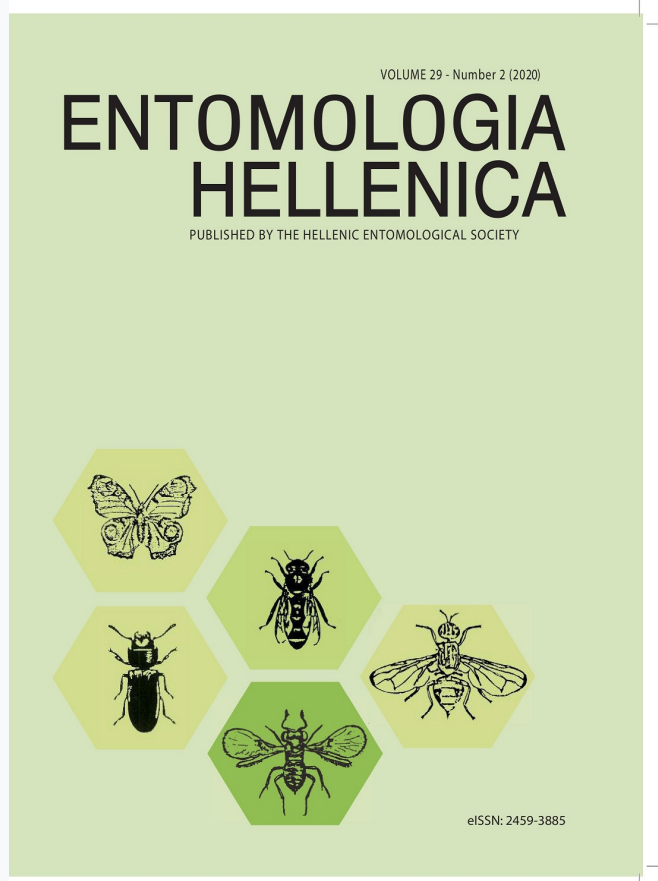


# ENTOMOLOGIA HELLENICA

Vol 29, No 2 (2020)



**On track to becoming a cosmopolitan invasive species: First record of the box tree moth *Cydalima perspectalis* (Lepidoptera: Crambidae) in the African continent**

*Karim Haddad, Konstantinos Kalaentzis, Jakovos Demetriou*

doi: [10.12681/eh.23483](https://doi.org/10.12681/eh.23483)

Copyright © 2020, Karim Haddad, Konstantinos Kalaentzis, Jakovos Demetriou



This work is licensed under a [Creative Commons Attribution-NonCommercial-ShareAlike 4.0](https://creativecommons.org/licenses/by-nc-sa/4.0/).

## To cite this article:

Haddad, K., Kalaentzis, K., & Demetriou, J. (2020). On track to becoming a cosmopolitan invasive species: First record of the box tree moth *Cydalima perspectalis* (Lepidoptera: Crambidae) in the African continent. *ENTOMOLOGIA HELLENICA*, 29(2), 27–32. <https://doi.org/10.12681/eh.23483>

# On track to becoming a cosmopolitan invasive species: First record of the box tree moth *Cydalima perspectalis* (Lepidoptera: Crambidae) in the African continent

K. HADDAD<sup>1</sup>, K. KALAENTZIS<sup>2,3,\*</sup> AND J. DEMETRIOU<sup>4,5</sup>

<sup>1</sup>Environmental Association EcoCirta, 25000 Constantine, Algeria

<sup>2</sup>Institute of Biology, Leiden University, Sylvius Laboratory, Sylviusweg 72, 2333 BE Leiden, The Netherlands

<sup>3</sup>Naturalis Biodiversity Center, PO Box 9517, 2300 RA Leiden, The Netherlands

<sup>4</sup>Section of Ecology and Systematics, Department of Biology,

National and Kapodistrian University of Athens, 15784 Athens, Greece

<sup>5</sup>Museum of Zoology, National and Kapodistrian University of Athens, 15784 Athens, Greece

## ABSTRACT

Native to Eastern Asia, the box tree moth *Cydalima perspectalis* (Walker, 1859) has managed to establish itself, and gradually expand its distribution, across Europe, Asia and recently America. This publication documents the first known record of the invasive species in Africa. The moth was observed in Constantine, Algeria in 2018 and was later identified as *C. perspectalis*. Possible scenarios of its introduction on the continent, as well as potential ecological implications, are discussed.

**KEY WORDS:** Lepidoptera, Crambidae, *Cydalima*, invasive species, first record, Africa.

## Introduction

Over the last decades, a progressive increase in human-mediated introductions of alien species has been observed worldwide, mostly due to globalization (Hulme 2009). This unprecedented rise in species translocations has altered the composition of biotas worldwide and can have extensive effects on native biodiversity, ecosystem stability, human health, and economy (Hulme 2009, Winter et al. 2009, Pyšek and Richardson 2010, Simberloff et al. 2013). Alien insect species represent one of the most numerous groups of introduced organisms (Roques et al. 2009), many of which with ecological impacts, on local flora (e.g. the lantana plume moth, *Lantanophaga pusillidactylus*;

Demetriou et al. 2020) or fauna (e.g. feather-legged fly, *Trichopoda pennipes*; Kazilas et al. 2020).

The genus *Cydalima* (Lederer, 1863) comprises of 9 species inhabiting the Eastern Palearctic and Oceania, of which *Cydalima perspectalis* (Walker, 1859) is the only species reaching as far as the Western Palearctic. Native to Eastern Asia, the box tree moth has been introduced, established and gradually expanded its distribution across Europe, Asia and recently as far as America (CABI 2020). Its recent dispersal has been closely associated with the import of ornamental box trees (*Buxus* spp.), the leaves and shoots of which serve as larval feed and hibernarium (Bury et al. 2017). It has become a serious pest for ornamental box

\*Corresponding author: [konstakal95@gmail.com](mailto:konstakal95@gmail.com)

shrubs in the urban landscape (parks, gardens). However, the real concern lies on its spread in nature reserves and protected areas, where it can cause severe defoliation on native box trees [*Buxus sempervirens* (Linnaeus, 1753) and *B. colchica* (Pojark, 1947); Kenis et al. 2013, Mitchell et al. 2018].

Summarizing the species' distribution in the Mediterranean basin (Fig. 1), it has been reported from most Southern European countries: France (Feldtrauer et al. 2008), Croatia (Koren and Črne 2012), Slovenia (Seljak 2012), Italy (Bella 2013, Uhl and Wölfling 2013), Spain (Pérez-Otero et al. 2014), Bosnia and Herzegovina (Ostojić et al. 2015), Greece (Strachinis et al. 2015), Albania (Raineri et al. 2017), Montenegro (Hrnčić and Radonjić 2017), Malta (Agius 2018), and Gibraltar (Pérez and Guillem 2019). Regarding the Levantine coast the species has been detected only in Turkey (Hizal et al. 2012) and until now it has never been reported from Africa. Herein, we provide the first record of the box tree moth from the African continent.

## Materials and Methods

On 29.ix.2018 a single adult was photographed in a garden, in the city centre of Constantine, Algeria (36.3643°, 6.6046°) by Dr. Karim Haddad (Fig. 2) and was subsequently added to iNaturalist online citizen science platform (iNaturalist 2020). The species was later identified as *Cydalima perspectalis*, due to its very distinguishable diagnostic characters; its rather large size, its white and slightly iridescent wings bordered by a dark brown costa, apex and tegmen as well as a white spot in the forewing's discoidal cell (Mally and Nuss 2010, Strachinis et al. 2015). Additional surveys were performed in order to confirm an established population of the species in Algeria, but no further individuals or infestation signs on box plants were observed.



FIG. 1. Physical map of the Mediterranean basin, where *Cydalima perspectalis* has been recorded. The shaded area represents the approximate distribution range of the species (by country; CABI, 2020). Our record in Constantine is indicated with X. Basemap: modified from Wikimedia Commons (creator: Nikita A. Zeemin). Inset: *C. perspectalis* (Thessaly, Greece); photo by C. Kazilas.

## Results and Discussion

The dispersal of the box tree moth on the northern coasts of Africa has been already predicted, in accordance to the necessary climatological factors needed for the species development (Nacambo et al. 2014). As in most introduction incidents of non-native insects (Rabitsch 2010), the horticultural introduction pathway is proposed, in this case with the import of ornamental *Buxus* trees. An accidental human mediated dispersal is considered as the most possible scenario, as the species was first discovered in the busy city centre of Constantine and has been referred to as a weak flier, being able to travel distances between 5-10 km (van der Straten and Muss 2010, Agius 2018). Thus, given the distance between Algeria and Southern European coasts the species should not be able to cross the Mediterranean Sea barrier. In addition, the accidental introduction of the species has been originally associated with the import of its host plant, which is commonly traded from China to Europe as an ornamental plant (Leuthardt et al. 2010, Nacambo et al. 2014).



FIG 2. Individual of *Cydalima perspectalis* photographed *in situ* from Constantine, Algeria. Photo by Dr. K. Haddad.

Further contamination and potential spread of the species to native box tree vegetation, present in the country, should be prevented through the use of insecticides and removal of larvae from ornamental *Buxus* clusters in the city centre of Constantine. This method was proposed by Kenis et al. (2014) and while regarded as a temporary solution could be the first line of defence until agents of classical biological control can be deployed (e.g. *Chelonus tabonus* (Sonan, 1932) (Wang et al. 2014). The small populations of *B. sempervirens* in Algeria represent its southernmost distribution (Yahi et al. 2012), while *B. balearica* (Lam, 1785) is range-restricted to the Iberian Peninsula and north-western Africa (Balearic Islands, Algeria, Morocco, Spain; Carvalho et al. 2016). The loss of native box tree vegetation has been shown to have adverse biological (e.g. decline or disruption of habitat, native biodiversity and ecosystem properties), societal (e.g. religion) and economic (e.g. wood usage) impacts (Mitchell et al. 2018). An effective eradication could also prevent the introduction to neighbouring countries where the box tree moth has not been observed yet (e.g. Morocco and Tunisia).

## References

- Agius, J. 2018. Pest species *Cydalima perspectalis* (Walker, 1859) new to the Maltese Islands (Lepidoptera: Crambidae). SHILAP Revista de lepidopterologia 46: 577–579.
- Bella, S. 2013. The box tree moth *Cydalima perspectalis* (Walker, 1859) continues to spread in southern Europe: new records for Italy (Lepidoptera Pyraloidea Crambidae). Redia 96: 51–55.
- Bury, J., T. Olbrycht, K. Mazur, P. Babula and P. Czudec. 2017. First records of the invasive box tree moth *Cydalima perspectalis* (Walker, 1859) (Lepidoptera: Crambidae) in south-eastern Poland. Fragmenta Faunistica 60: 101–106.

- CABI. 2020. Invasive Species Compendium: *Cydalima perspectalis*. Accessed on April 28, 2020, last updated on 23 April 2020. Available online at: <https://www.cabi.org/isc/datasheet/118433>
- Carvalho, M., J. Rocha, V. Carnide, S. Martins, M. Mus, F. Amich, R. Almeida, C. Machado, B. Gonçalves, E. Bacelar and I. Crespi. 2016. Biogeographic divergences in the Iberian flora. A morpho-anatomic, ISSR-based, and environmental study of Iberian *Buxus sempervirens* L. Turk. J. Bot. 40: 1–16.
- Demetriou, J., C. Kazilas, E. Koutsoukos and K. Kalaentzis. (2020). A new tropical invader in Greece: The lantana plume moth *Lantanophaga pusillidactylus* (Lepidoptera: Pterophoridae). Entomolog. Hell. 29: 1–7.
- Feldtrauer, J.F., J.J. Feldtrauer and C. Brua. 2009. Premiers signalements en France de la Pyrale du Buis *Diaphania perspectalis* (Walker, 1859), espèce exotique envahissante s'attaquant aux Buis (Lepidoptera, Crambidae). Bull. de la Société entomologique de Mulhouse 65: 55–58.
- Hizal, E., M. Kose, C. Yesil and D. Kaynar. 2012. The New Pest *Cydalima perspectalis* (Walker, 1859) (Lepidoptera: Crambidae) in Turkey. J. Anim. Vet. Adv. 11: 400–403.
- Hrnčić, S. and S. Radonjić. 2017. *Cydalima perspectalis* Walker (Lepidoptera: Crambidae) Presence and Distribution in Montenegro. Agro-knowledge J. 18: 275–284.
- Hulme, P.E. 2009. Trade, transport and trouble: managing invasive species pathways in an era of globalization. J. Appl. Ecol. 46: 10–18.
- iNaturalist. 2020. Box Tree Moth (*Cydalima perspectalis*). Observed: Sep 29, 2018. Submitted: Sep 29, 2018. Accessed on 14 August, 2020. Available online at: <https://www.inaturalist.org/observations/17021677>.
- Kazilas, C., J. Demetriou and K. Kalaentzis. (2020). Filling the gaps in the distribution of an alien species: The case of the feather-legged fly *Trichopoda pennipes* (Diptera: Tachinidae) in the Western Palearctic. Entomolog. Hell. 29: 8–16.
- Kenis, M., S. Nacambo, F.L.G. Leuthardt, F. Domenico and T. Haye. 2013. The box tree moth, *Cydalima perspectalis*, in Europe: horticultural pest or environmental disaster? Aliens 33: 38–41.
- Koren, T. and M. Črne. 2012. The first record of the box tree moth, *Cydalima perspectalis* (Walker, 1859) (Lepidoptera, Crambidae) in Croatia. Nat. Croat. 21: 507–510.
- Leuthardt, F.L.G., W. Billen and B. Baur. 2010. Ausbreitung des Buchsbaumzünslers *Diaphania perspectalis* (Lepidoptera: Pyralidae) in der Region Basel – eine für die Schweiz neue Schädlingsart. Entomo Helvetica 3: 51–57.
- Mally, R. and M. Nuss. 2010. Phylogeny and nomenclature of the box tree moth, *Cydalima perspectalis* (Walker, 1859) comb. n., which was recently introduced into Europe (Lepidoptera: Pyraloidea: Crambidae: Spilomelinae). European Journal of Entomology 107: 393–400.
- Mitchell, R., S. Chitanava, R. Dbar, V. Kramarets, A. Lehtijärvi, I. Matchutadze, G. Mamadashvili, I. Matsiakh, S. Nacambo, I. Papazova-Anakieva, S. Sathyapala, B. Tuniyev, G. Véték, M. Zukhbaia and M. Kenis. 2018. Identifying the ecological and societal consequences of a decline in *Buxus* forests in Europe and the Caucasus. Biol. Invasions 20: 3605–3620.
- Nacambo, S., F.L.G. Leuthardt, H. Wan, H. Li, T. Haye, B. Baur, R.M. Weiss and M. Kenis. 2014. Development characteristics of the box-tree moth *Cydalima perspectalis* and its potential distribution in Europe. J. Appl. Entomol. 138: 14–26.



- Ostojić, I., M. Zovko, D. Petrović, and D. Elez. 2015. New records of box tree moth *Cydalima perspectalis* (Walker, 1859) in Bosnia and Herzegovina. *Radovi*
- Pérez-Otero, R., J.P. Mansilla and M. Vidal. 2014. *Cydalima perspectalis* Walker, 1859 (Lepidoptera: Crambidae): una nueva amenaza para *Buxus* spp. en la Península Ibérica. *Archivos Entomológicos* 10: 225–228.
- Pérez, C.E. and R.M. Guillem. 2019. Primeros registros de las especies plaga *Cydalima perspectalis* (Walker, 1859) y *Paysandisia archon* (Burmeister, 1880) en Gibraltar (Lepidoptera: Crambidae & Castniidae). *Sociedad Gaditana de Historia Natural* 13: 15–18.
- Pyšek, P. and D.M. Richardson. 2010. Invasive species, environmental change and management, and health. *Ann. Rev. Environ. Resour.* 35: 25–55.
- Rabitsch, W. (2010) Pathways and vectors of alien arthropods in Europe. Chapter 3. In: Roques, A. et al. (Eds) Alien terrestrial arthropods of Europe. *BioRisk* 4: 27–43.
- Raineri, V., F. Bonechi, D. Caracciolo, P. Cresta and M. Mariotti. 2017. *Cydalima perspectalis* (Walker, 1859) (Lepidoptera, Crambidae) and the threats for the Nature 2000 habitat 5110 in Liguria (NW-Italy). *Bollettino dei musei e degli istituti biologici dell'Università di Genova* 79: 215–236.
- Roques, A., W. Rabitsch, J.Y. Rasplus, C. Lopez-Vaamonde, W. Nentwig and M. Kenis. 2009. Alien terrestrial invertebrates of Europe. In: *Handbook of alien species in Europe*. Springer. pp. 63–79.
- Seljak, G. 2012. Six new phytophagous insect species recorded in Slovenia in 2011. *Acta Entomol. Slov.* 20: 31–44.
- Simberloff, D., J.L. Martin, P. Genovesi, V. Maris, D.A. Wardle, J. Aronson, F. Courchamp, B. Galil, E. García-Berthou, M. Pascal, P. Pyšek, R. Sousa, E. Poljoprivrednog Fakulteta Univerziteta u Sarajevu (Works of the Faculty of Agriculture University of Sarajevo) 60: 139–143.
- Tabacchi and M. Vilà. 2013. Impacts of biological invasions: what's what and the way forward. *Trends Ecol. & Evol.* 28: 58–66.
- Strachinis, I., C. Kazilas, F. Karamaouna, N.E. Papanikolaou, G.K. Partsinevelos and P.G. Milonas. 2015. First record of *Cydalima perspectalis* (Lepidoptera: Crambidae) in Greece. *Hell. Plant Prot. J.* 8: 66–72.
- Uhl, B. and M. Wölfling. 2013. New record of the invasive pest species *Cydalima perspectalis* (Walker, 1859) in Emilia Romagna (Italy) (Lepidoptera: Crambidae, Spilomelinae). *Nachrichten des Entomologischen Vereins Apollo* 34: 91–93.
- van der Straten M.J. and T.S.T. Muus. 2010. The box tree pyralid, *Glyphodes perspectalis* (Lepidoptera: Crambidae), an invasive alien moth ruining box trees. *Proc. Neth. Soc. Meet.* 21: 107–111.
- Wang, H., T. Haye, M. Kenis, S. Nacambo, H. Xu, F. Zhang and H. Li. 2014. Biology and natural enemies of *Cydalima perspectalis* in Asia: Is there biological control potential in Europe? *Journal of Applied Entomology* 138: 715–722.
- Winter, M., O. Schweiger, S. Klotz, W. Nentwig, P. Andriopoulos, M. Arianoutsou, C. Basnou, P. Delipetrou, V. Didžiulis, M. Hejda, P.E. Hulme, P.W. Lambdon, J. Pergl, D.B. Roy and I. Kühn. 2009. Plant extinctions and introductions lead to phylogenetic and taxonomic homogenization of the European flora. *Proc. Natl. Acad. Sci.* 106: 21721–21725.
- Yahi, N., E. Vela, S. Benhouhou, G. De Belair and R. Gharzouli. 2012. Identifying important plants areas (Key biodiversity areas for plants) in northern Algeria. *J. Threat. Taxa* 4: 2753–2765.

## Καθοδόν να καταστεί κοσμοπολίτικο εισβλητικό είδος: Πρώτη καταγραφή του λεπιδόπτερου *Cydalima perspectalis* (Lepidoptera: Crambidae) στην Αφρικανική ήπειρο

**K. HADDAD<sup>1</sup>, K. ΚΑΛΑΕΝΤΖΗΣ<sup>2,3,\*</sup> ΚΑΙ Ι. ΔΗΜΗΤΡΙΟΥ<sup>4,5</sup>**

<sup>1</sup>Περιβαλλοντική Εταιρεία EcoCirta, 25000 Constantine, Αλγερία

<sup>2</sup>Ινστιτούτο Βιολογίας, Πανεπιστήμιο του Λέιντεν, Sylvius Laboratory, Sylviusweg 72, 2333 BE, Λέιντεν, Ολλανδία

<sup>3</sup>Naturalis Biodiversity Center, PO Box 9517, 2300 RA, Λέιντεν, Ολλανδία

<sup>4</sup>Τομέας Οικολογίας και Ταξινομικής, Τμήμα Βιολογίας,

Εθνικό Καποδιστριακό Πανεπιστήμιο Αθηνών, 15784 Αθήνα

<sup>5</sup>Μουσείο Ζωολογίας, Εθνικό Καποδιστριακό Πανεπιστήμιο Αθηνών, 15784 Αθήνα

### ΠΕΡΙΛΗΨΗ

Ιθαγενές στην Ανατολική Ασία, το λεπιδόπτερο *Cydalima perspectalis* (Walker, 1859) έχει καταφέρει να εδραιωθεί και σταδιακά να επεκτείνει την κατανομή του στην Ευρώπη, την Ασία και πρόσφατα την Αμερική. Η δημοσίευση αυτή τεκμηριώνει την πρώτη γνωστή καταγραφή του εισβλητικού είδους στην Αφρική. Το λεπιδόπτερο παρατηρήθηκε στην πόλη Constantine της Αλγερίας το 2018 και αργότερα αναγνωρίστηκε ως *C. perspectalis*. Αναλύονται τα πιθανά σενάρια εισαγωγής του στην ήπειρο, καθώς και πιθανές οικολογικές επιπτώσεις.