



First records of the invasive box tree moth *Cydalima perspectalis* (Walker, 1859) (Lepidoptera: Crambidae) in south-eastern Poland

Jarosław BURY¹, Tomasz OLBRYCHT², Krzysztof MAZUR³,
Paweł BABULA⁴ and Paweł CZUDEĆ⁵

¹Markowa 1498, 37-120 Markowa, Poland; e-mail: jarekbury2@wp.pl (corresponding author)

²University of Rzeszów, Faculty of Biology and Agriculture, Department of Agroecology,
M. Ćwiklińskiej 1a, 35-601 Rzeszów, Poland; e-mail: tkolbr@ur.edu.pl

³Umieszcz 76, 38-204 Umieszcz, Poland

⁴Królewska 21, 35-616 Rzeszów, Poland

⁵Malczewskiego 3/44, 35-114 Rzeszów, Poland

Abstract: The paper presents the first records of box tree moth from a few localities situated in 5 UTM squares in the Podkarpacie region – in the south-eastern Poland. This species, native to the subtropical regions of East Asia, was accidentally introduced into Europe in the first decade of the 21st century. Box tree moth was observed for the first time in Poland in 2012, and more recently in the Podkarpacie region in 2016. The rapid expansion of the species is mostly explained by the transfer of its preimaginal stages along with its main host plant (*Buxus* spp.).

Key words: invasive species, new records, faunistic data, SE Poland. Podkarpacie

INTRODUCTION

Cydalima perspectalis (Walker, 1859) is a member of the Crambidae family, and the subfamily of Spilomelinae. Its native range covers the subtropical regions of south-east Asia, from India across China, Taiwan, Korea and Japan to the Russian Far East (Mally & Nuss 2010). In Europe the box tree moth was first detected in the first decade of the 21st century. The species was recorded from Germany as new to the fauna of Europe after its accidental introduction, probably in the period 2005–2007 (Billen 2007, Krüger 2008). Preimaginal stages of the species can be easily spread from China with various decorative varieties of its main host plant (*Buxus* spp.).

At present *C. perspectalis* is known from many European countries – Germany, Switzerland (Käppeli 2008, Sigg 2009), Liechtenstein (Slamka 2010), Luxemburg (Ries et al. 2017), The Netherlands (Muus et al. 2009), Belgium (Casteels et al. 2011), Denmark (Hobern 2013), Great Britain (Mitchell 2009), France (Feldtrauer et al. 2009), Spain (Pérez-Otero 2014, Pino Pérez & Pino Pérez 2014), Austria (Rodeland 2009, Kuzmits 2012), Italy (Griffo et al. 2012, Bella 2013), Czech Republic (Šumpich 2011), Slovakia (Pastorális et al. 2013), Hungary (Sáfián & Horváth 2011), Romania (Székely et al. 2011), Slovenia (Seljak 2012), Croatia (Koren & Črne 2012, Matošević 2013), Serbia (Konjević et al. 2015, Stojanović et al. 2015), Montenegro (Hrnčić & Radonjić 2014), Bosnia and Herzegovina (Ostojić et al. 2014), Albania (Raineri et al. 2017), Bulgaria (Beshkov et al. 2015), Greece (Strachinis et al. 2015), Turkey (Hizal et al. 2012), Georgia (Matsiakh 2014), Ukraine (Budashkin 2016) and Russia (Proklov & Karayeva 2013). The chronology of the spread of *C. perspectalis* in some European countries (omitting data from Poland and Ukraine) is given by Raineri et al. (2017) who reported on the threat of xerothermophilous formations with *Buxus sempervirens*, the nature 2000 habitat in Liguria with this pest.

In Poland, the species was observed for first time in 2012 in the Dolny Śląsk region, and subsequently in the Opolszczyzna and Małopolska regions in 2015 (Blaik et al. 2016).

The biology of *C. perspectalis* is very well known in its native Asia (Wan et al. 2014). The species produces three to five generations per year, and caterpillars feed on the leaves of its main host plants (*Buxus* spp.). Other plants such *Euonymus japonicus* and *Ilex purpurea* are also mentioned as host plants of the species in Japan (Mally & Nuss 2010). In southern European conditions *C. perspectalis* produces three to four, and in central European conditions two to three, generations per year. Larvae feed so far only on box tree species which in Europe are mostly the ornamental plants and hedges. Tests with other plants: *Euonymus japonicas*, *Ilex aquifolium* and *Ligustrum vulgare*, have shown that *C. perspectalis* caterpillars are not able to feed on them (Matošević et al. 2017). The species overwinters as a juvenile larva (about 5–10 mm long), protected in a hibernarium made of two living host plant leaves solidly joined by silk. The 2–6 week period of winter diapause is obligatory. In Europe, in the regions where the species has been introduced, it has no natural enemies, and the damage caused by caterpillars can be very serious.

At present, in all of the colonized countries, *C. perspectalis* is treated as a pest with great economic importance.

The aim of this paper is to note the present of *Cydalima perspectalis* in the most eastern region of the south Poland – the Subcarpathian Province (Podkarpacie).

MATERIALS AND METHODS

The fieldwork was carried out in the Podkarpacie region in south-eastern Poland, over the period 2016–2017. The names of mesoregions and macroregions are given according to Kondracki (2002). UTM (Universal Transverse of Mercator) co-ordinates (10x10 km grid) are provided for each site of observation. The caterpillars were sought on the main host plant – *Buxus* spp. in city parks and village gardens. The moths were attracted to the UV light. The light traps were installed in 15 sites (Fig. 1) in various urban, suburban and rural habitats, in the same places during both years of observation. Only one trap was installed on each site. The trapping season covered the period from early March to late November, and each trap was controlled at least once a week. Some individuals were caught and deposited in the private collections of the authors. The occurrence of the rest was documented by photographs.

RESULTS

Imagines of *C. perspectalis* in the period 2016–2017 were found in the Podkarpacie region at the following sites:

2016

- Pogórze Środkowobeskidzkie (Beskidy Środkowe Foothills)
 - Pogórze Strzyżowskie (Strzyżów Foothills): EA24 Grabiny, 17 Sep 2016, 1 ex., idem, 18 Sep 2016, 3 exx., ad lucem, leg. et coll. Ł. Solecki.
 - Pogórze Jasielskie (Jasło Foothills): EA30 Umieszcz, 26 Sep 2016, 1 ex., ad lucem, leg. et coll. K. Mazur.
 - Pogórze Dynowskie (Dynów Foothills): EA73 Rzeszów–Zalesie, 02 Oct 2016, 1 ex., ad lucem, leg. et coll. T. Olbrycht.

2017

- Pogórze Środkowobeskidzkie (Beskidy Środkowe Foothills)
 - Pogórze Strzyżowskie (Strzyżów Foothills): EA24 Grabiny, 12–15 Aug 2017, 4 caterpillars on *Buxus* sp., home garden, obs. Ł. Solecki.

- Pogórze Dynowskie (Dynów Foothills): EA73 Rzeszów–Zalesie, historical park, 22 Jun 2017, 2 exx., idem, 18 Aug 2017, 19 exx., idem, 19 Aug 2017, 12 exx., idem, 03 Sep 2017, 18 exx., idem, 09 Sep 2017, 4 exx., ad lucem, leg. et coll. T. Olbrycht. EA74 Rzeszów–Mieszka I, Letnia str., Aug 2017, 1 ex., ad lucem, leg. et coll. Z. W. Czerniakowski, Rzeszów, 04 Sep 2017, 1 ex., ad lucem, obs. D. Wyczarski, Rzeszów–Wilkowyja, 8 Aug 2017, 10 exx., around 1.30 after midnight to UV lighth, leg. et coll. P. Babula, Rzeszów–Osiedle Kmity, 10 Sep 2017, 5 exx., ad lucem, at the entrances to residential buildings, obs. & photo. P. Czudec.
- Kotlina Sandomierska (Sandomierz Valley)
 - Podgórze Rzeszowskie (Rzeszów Foreland): EA64 Zgłobień, 13 Sep 2017, 2exx., ad lucem, obs. & photo. P. Czudec.

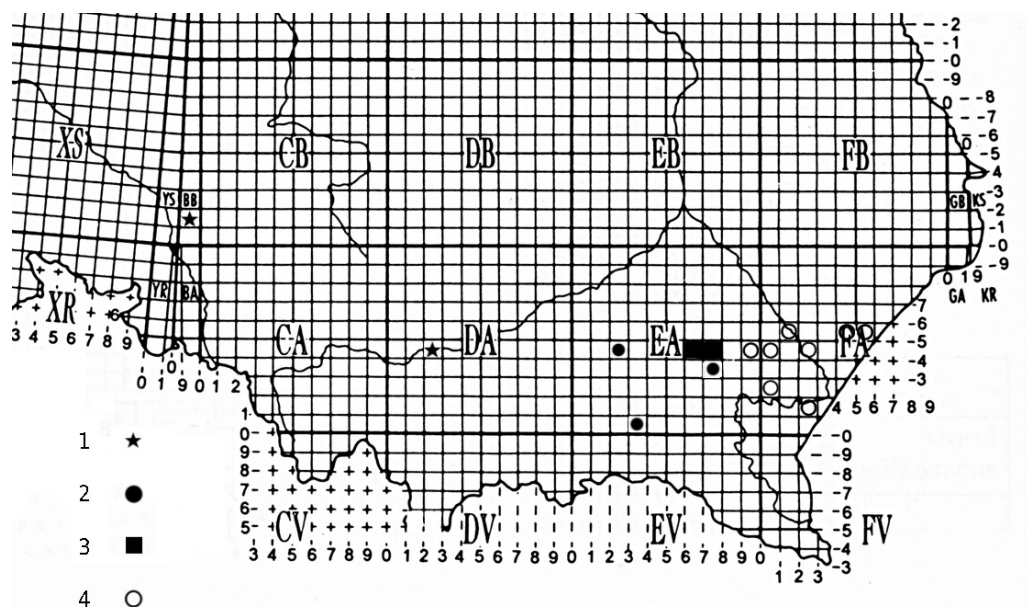


Fig. 1. Distribution of *Cydalima perspectalis* (Walker, 1859) in S & SE Poland. 1– data from literature, 2 – new data from 2016, 3 – new data from 2017, 4 – localities where appearance of the species was not stated.

In the period 2016–2017 mature individuals appear in two well-separated broods – the first one in June and the second from the first decade of August to the first decade of October. The second brood was much more numerous than the first (Fig. 2).

Caterpillars have been observed in the surveyed area only on *Buxus* sp., despite a purposeful search for preimaginal stage individuals in many places.

DISCUSSION

Cydalima perspectalis was found in Podkarpacie, the most eastern region of the south Poland, for the first time in September 2016. The species had spread quickly in Poland, since it was first observed in the southwestern part of the country (Lower Silesia) in 2012. In 2015 the box tree moth was found in the two regions located further to the east (Opolskie and Małopolskie Voivodeships) of southern Poland (Blaik et al. 2016). At present the species is

known in almost all southern regions of the country. The species has already been found in all southern neighbors: Hungary and the Czech Republic in 2010, Slovakia in 2012 and even in Ukraine (around Kiev, Transcarpathia and Crimea, although until 2015 it was not widespread outside these places) (Sáfián & Horváth 2011, Šumpich 2011, Pastorális et al. 2013, Budashkin 2016, Oberemok et al. 2016, Nagy et al. 2017).

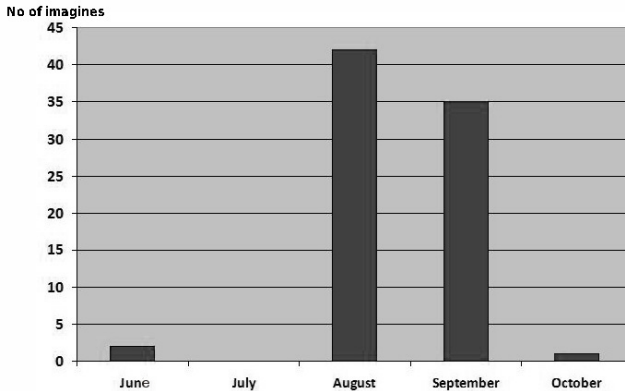


Fig. 2. Phenology of *Cydalima perspectalis* (Walker, 1859) in Podkarpacie region (SE Poland) in the period 2016–2017.

In the Podkarpacie region the box tree moth has colonized four mesoregions so far: the Jasło Foothills, Strzyżów Foothills, Dynów Foothills and Rzeszów Foreland, within two macroregions: the Beskidy Środkowe Foothills and Sandomierz Valley. Most of the observations come from urban areas, especially from the vicinity of Rzeszów, and only a few from the rural areas outside the city. The fact that in the year 2016 only 3 mature individuals were observed, while in 2017 there were already 77, suggests the high dynamism of the expansion process in the region. However, in almost half of the places studied, the species was not stated (Fig.1).

Thanks to the significant number of moth observations, the phenology of the species in the Podkarpacie region was initially established (Fig. 2). The phenology of the appearance of imagines observed in south-eastern Poland corresponds to observations from the western part of the country (Blaik et al. 2016). In the more southern countries, like Hungary, Slovakia and West Ukraine the species appears in three generations (Nagy et al. 2017). Finding caterpillars only on box tree confirms previous observations on the nutrition preferences of preimaginal stages of the species obtained in the other parts of Europe (Leuthardt & Baur 2013, Matošević et al. 2017).

It should be noted that after the alien species as: *Phyllonorycter issikii* (Kumata 1963), *Ph. robiniella* (Clemens, 1859), *Ph. platani* (Staudinger, 1870) and *Leptoglossus occidentalis* Heidemann, 1910 – *C. perspectalis* is yet another invasive species of insect that has appeared in south-eastern Poland in recent years and potentially poses a serious threat to ornamental plants grown in parks and gardens (Czerniakowski & Olbrycht 2015). Monitoring of the spread of these species would be desirable due to their economic importance (Nacambo et al. 2014). It is essential to do it not only on a regional scale, but also on national and international scale.

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STRESZCZENIE

[Pierwsze obserwacje inwazyjnego gatunku motyla *Cydalima perspectalis* (Walker, 1859) (Lepidoptera: Crambidae) w południowo-wschodniej Polsce]

Cydalima perspectalis (Walker, 1859) jest przedstawicielem rodziny Crambidae i podrodziny Spilomelinae. W naturze motyl ten zasiedla subtropikalne regiony południowo-wschodniej Azji, w Europie po raz pierwszy został stwierdzony w Niemczech w pierwszej dekadzie 21. wieku. W chwili obecnej znany jest z większości środkowo- i południowo europejskich krajów. W Polsce gatunek został stwierdzony po raz pierwszy w 2012 roku na zachodzie i szybko rozprzestrzenił się w południowej części kraju. W trakcie obserwacji dokonanych w latach 2016–2017 *C. perspectalis* został po raz pierwszy odnaleziony na Podkarpaciu (południowo-wschodnia Polska). Obecnie znany jest w czterech mezoregionach w centralnej i południowej części województwa (okolice Rzeszowa, Strzyżowa i Jasła). Ze względu na możliwość wyrządzania poważnych szkód w uprawach bukszpanu (*Buxus* spp.) motyl uznawany jest za groźnego szkodnika, o dużym znaczeniu gospodarczym. Jest to kolejny inwazyjny gatunek owada zanotowany w ostatnich latach na Podkarpaciu.