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Research paper

The Range Expansion of *Ovalisia festiva* (Linnaeus, 1767) (Coleoptera: Buprestidae) in Eastern Europe and Its Damaging Potential for Cupressaceae

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Abstract. Ovalisia festiva (Linnaeus, 1767), previously considered a very rare and localised (accidental) species in Eastern Europe (Hungary, Romania), is recorded as a real pest for Cupressaceae in the Romanian Plain – the Easternmost site, out of the species' previously known range. In comparison with the annual life cycle of the species in the Mediterranean region, in Romania the adults emerged between the second and the eighth year after the trees were planted, causing an attack of over 50% per cultivar. New data on intraspecific variability, distribution, and duration of the life cycle of this jewel beetle in Romania are presented.

Key words: Ovalisia festiva, jewel beetle, distribution, life cycle duration, morphological variability, Juniperus scopulorum, Romanian Plain, Thuja occidentalis.

INTRODUCTION

According to Holyńsky (1999), subgenus *Palmar* Schaefer, 1949 of genus *Ovalisia* Kerremans, 1900 includes approximately 35 species that are widely spread in the Indo–Pacific region, only three of them reaching the Mediterranean region in the west: *O. (P.) festiva* (Linnaeus, 1767), *O. (P.) balcanica* (Kirchsberg, 1876) and *O. (P.). holzchuhi* Herllrigl, 1972. Other three species are known for Taiwan [*Palmar igneolimbata* (Kurosawa, 1946), *P. cupreosplendens* (Kerremans, 1895), *P. davidis* (Fairmaire, 1887)] and, according to Hellrigl (2010), *P. virgata* (Motschulsky, 1859) reaches China and Japan.

Ovalisia festiva feeds on Cupressaceae. It was frequently recorded in the Mediterranean region (Morocco, Algeria, Tunisia, Greece, Italy, Spain, Portugal, France) (Curletti, 2006; Nichane and Khelil, 2014), quite frequent in Slovenia (Hellrigl, 1972; Ratzinger et al., 2013) and rarely encountered in Austria, southern Germany, Bulgaria, Hungary (Hellrigl, 2010). Only four specimens found in middle of 20th century are known from Romania. Recently, however, with the spread of planting and transport of ornamental Cupressaceae, and perhaps also in connection to global climate change (Wermelinger, 2011), the species has begun to spread. It is more frequently recorded in central and eastern European regions (Rahme, 2013; Gabor & Sütórine–Diószegi, 2014; Thoma & Eickermann, 2014), where it was rare, or missing (Hellrigl, 1972; Hellrigl, 2010; Ratzinger et al., 2013). In Mediterranean area, the species has become a serious pest of Cupressaceae (Covassi et al., 1998; Parrini, 2004; Nichane and Khelil, 2014).

In 2014, the species was found to occur in large number and causing serious damage to *Thuja occidentalis* L. at Moara Domnească and Pipera cultivars in the homonymous sites (Ilfov County, Romania). Since there is no information about the actual distribution and biology of the species in Romania, we present new data on *Ovalisia (P.) festiva* and compare it to the available information. We also assess the species potential to become a serious threat to ornamental Cupressaceae in Romania.

MATERIAL AND METHODS

Examined material: $1 \ 3, 3 \ 9 \ 10-20$ June 2014, Moara Domnească cultivar; 12 $\ 3 \ 9 \ 9$ Pipera cultivar. The specimens from Pipera cultivar emerged from attacked trunks and branches cut at the end of August – beginning of September, and stored in a closed deposit, where the adults emerged towards the end of 2014 autumn.

All four specimens from Moara Domnească emerged from four-year-old *Thuja occidentalis* L. ("Smaragd" variety) trees. The other 18 specimens from the Pipera cultivar emerged from 8–10 year-old trees of the same species and variety.

The *Thuja* saplings in Pipera as well as in Moara Domnească were imported and planted directly from abroad, at the age of about two and until 2014 these did not exhibit any signs of specific attack.

The specimens were examined using a 'Discovery V8' Zeiss stereomicroscope and the photos processed using the CombineZP software (Hardley, 2010).

For identification, we used the identification keys published by Hellrigl (1972), Harde (1979), with the additions published by Hellrigl (2010).

RESULTS AND DISCUSSIONS

The 22 specimens collected in 2014 allowed us to perform a first study on the intraspecific variability of this species and its differentiation from a controversial taxon so far included in the subgenus *Palmar* Schaefer, 1949 – *Ovalisia (Palmar) holzschuhi*, described as *bona species* by Hellrigl (1972) from Turkey and then considered by other authors to be a subspecies of the species *O. festiva* (http://www.biolib.cz), or as a valid species (Hellrigl, 2010).

Taxonomy

The species included in the genus *Ovalisia* Kerremans, 1900 are characterized by the last article of the maxillary palp widened, a wide scutellum, non-caudal apex of the elytra, and the dorsal part of the body with a metallic green colour with bluish or copper shades and dark spots. According to some authors (http://www.biolib.cz), *Ovalisia* is the new synonym of the genus *Lamprodila* Motschulsky, 1860 (= *Scintilatrix* Obenberger, 1956). The subgenus *Palmar* includes species with large dark spots (they are not limited to the width of the interstriae) on the elytra, symmetrically disposed, well-defined, and the elytrae are green or bluish-green, without the lateral purple edge.

Ovalisia (P.) festiva is different taxonomically from *O. (P.) balcanica* by its much more convex and longer body, by the ventral colour of body, which has the same shade as its dorsal part (green), unlike *O. (P.) balcanica* whose ventral part is dark violet coloured. The shape of the aedeagus of *Ovalisia festiva* is different from that of *O. balcanica*. Another species, *Ovalisia (P.) cretica* Zabransky, 1994, seems not to be able to be differentiated from *O. festiva* based on the characters described by the author and we agree with Holynski (1999) that 'apparently none of the characters quoted by Zabransky (1994) does exceed the limits of variability of *O. festiva*'.

Unlike the distinctive taxonomic characters enumerated by Hellrigl (1972) through which *Ovalisia festiva* is differentiated from *O. holzschuhi*, in the analysed specimens we noticed a significant variability in terms of the presence of the smooth median line of the pronotum (present in *Ovalisia festiva* and absent in *O. holzschuhi*), which is more or less obvious from a specimen to another. The microreticulation of the elytra varies from its being almost absent (according to Hellrigl's identification key) to its slight identification. The characters which lead us to agree with the specifications made by Hellrigl (2010) – that "*Ovalisia festiva* and *O. holzschuhi* are distinct species", are: the size of the pronotum which is one and half (1.5 ×) wider than longer at *O. festiva* while at *O. holzchuhi* is two times (2 ×) wider than longer. Also, all our specimens had a smooth pronotal surface (without microreticulations), typical for *Ovalisia festiva*, as compared to the highly microreticulated (matte) one in *O. holzschuhi* (Helligl 2010; photo U. Scmidt 2008: www.kaefer-der-welt.de/ palmar holzschi.htm).

Regarding the colours and shapes of the black spots on the elytrae, we noticed a great variability (Fig. 1), which renders this character useless in differentiating the two species. The length of the analysed specimens varied from 8.74 mm to 6.3 mm. Regarding the male genitalia (aedeagus) (Fig. 2) and the male and female anal sternites (Fig. 3), we did not identify a noteworthy variability, they coincide with Herrligl's observations (1972) and we consider them conclusive and distinct enough to establish *Ovalisia holzchuhi* as *bona species*, different from *O. festiva*. The female genitalia (ovipositor) – according to fig. 4.



Fig. 1 – The variation of the dorsal colours and black spot shapes on two specimens of *Ovalisia festiva* (Pipera cultivar). Scale bar: 1 mm.



Fig. 2 - Aedeagus of Ovalisa festiva (Pipera cultivar).

Geographical distribution

As we mentioned in the introductory chapter, the species was recorded as frequent in the Mediterranean area and quoted as a rare species in the Central and Eastern Europe.

In the Romanian fauna, *Ovalisia festiva* was known based only on four specimens from two sites: Baia de Aramă (8.07.1961, 17.07.1961, 20.07.1957 leg. et det. N. Săvulescu – Săvulescu's Collection) (Ruicănescu & Serafim, 1996) and Bistrețu (15.07.1966, leg. I. Firu – the Collection of Craiova Museum).



Fig. 3 – Ovalisia festiva, Shape of the anal sternite: A, females; B, males.



Fig. 4 – Ovalisia festiva, ovipositor.

In the past years, the species was recorded in relatively large number of individuals located in the north and north–eastern sites of the range of the species, in Hungary (Gabor & Sütörine, 2013; Rahme, 2013), Luxembourg (Thoma & Eickermann, 2014) and now in Romania (Fig. 5).

Biology of the species

The larvae develop into various species of Cupressaceae: *Platycladus orientalis* (L.), *Callitris* sp., *Chamaecyprias lawsoniana* (A. Murr.), *Cupressus* sp., *Juniperus communis* L., *J. oxycedrus* Sibth. & Sm., *J. phoenicea* L., *J. thurifera* L., *Thuja occidentalis* L., *Ziziphus lotus* Desf. (Culetti, 1994), *Tetraclinis articulata* (Nich. & Khelil). The larvae develop on the lower part of branches of trunks where they dig sinuous sub–cortical galleries that affect the phloem tissue. The beetles deteriorate the xylem and decrease the mechanical integrity of the trunk and branches. The first signs of the attack are chlorosis and then the leaves whither (Ratzinger et al., 2013).

The adults are active during the day, being heliophilic and thermophilic. They fly into the treetop, to the outer edge of the branches. The period for the mating flight is in the summer, between May–August.



Fig. 5 – The range of *Ovalisia festiva*: black circles – the range of the species according to Hellrigl (1972); white circles – additions to the range made by Curletti (2006); triangle – the old sites in which the species was identified in the Romanian fauna (collection samples, not taken into account by previous authors); cross – new site in Hungary (Rahme, 2013); pentagon –new site in Luxembourg (Thoma & Eickermann, 2014); star – new records in Romania (Pipera, Moara Domnească, 2014). Black square – distribution of *Ovalisia holzschuhi* Hellrigl, 1972 according to the nomenclatorical author.

It is known that the development of many species of insects is temperature dependent. As Lyons (2010) proved for Buprestidae "the date of events in the life cycle is dependent on the accumulation of enough heat to complete each stage of development, which in turn is a function of local weather. Typically, slower heat accumulation occurs at higher latitudes and altitudes". In this respect, for *Buprestis aurulenta* Linnaeus, 1767, Duncan (2001) indicates that the larvae development interval normally lasts between two and four years, but, "when infested wood is subjected to seasoning and low humidity, as it is in structures, the life cycle of the golden buprestid is so altered that the larvae may live up to 60 years and adults may emerge from the wood at any season".

The length of the development cycle for *Ovalisia festiva* differs from one region to another. Thus, in the Mediterranean region (the region where the species originate from) the entire development cycle takes one year, with winter dormancy at larva stage (Nichane & Khelil, 2014). The pupation is completed at the end of March – beginning of April, and adults emerge from May to August. In Slovenia and Germany, however, the development takes two-three years (Ratzinger et al., 2013; Wermelinger, 2011). In Luxembourg, the Ovalisia festiva adults emerged on Thuja occidentalis trees (the Smaragd type) during the fourth year after the trees were planted. In Romania, in the context in which the two-year old saplings were planted in the open directly, in Moara Domnească, the adults emerged in the second year after the trees were planted, and in Pipera, all the adults emerged between the sixth and the eighth year after the trees were planted (which means at least two years and a maximum of six years from infestation), as before there was no specific sign of attack and no adult was spotted flying by (neither in nurseries nor in cultivars). The larvae galleries were noticed in the area located from the bottom to 1.5 m high on the trunk. The attack started approximately 20 cm from the ground and the attacked areas were both the main axis and the areas where the main branches are inserted on the axis, the strongest attack displaying between 16 and 20 galleries per axis, and the weakest one, 3 - 4 galleries. Of the 49 trees, 17 were destroyed and 8 are under attack (specimens subject to), the result being an attack of over 50% per cultivar. In addition, at Pipera, four trees of Juniperus scopulorum Sargent 1897 'Skyrocket' were attacked (9 to 17 galleries per axis) in 2014, suggesting that Ovalisia ferstiva became a real threat for the cultivars of Cupressaceae in southern regions of Romania.

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