

Distribution and Infiltration of the Tree Cricket *Oecanthus pellucens* (Scopoli, 1763) to Unoriginal Conditions in Slovakia

by

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Abstract: The tree cricket *Oecanthus pellucens* (Scopoli, 1763) represents the only species of *Oecanthinae* subfamily in Slovakia and it is generally distributed in Central and especially Southern Europe, in Asia as well as in Northern Africa. The northern boundary of its geographical distribution crosses Slovakia. It belongs to the markedly xerothermophilous orthopterous insect species, occurring in dry steppe or woodland steppe biotopes of Slovakia. However, the incoming process of aridisation, due amongst other factors to the construction of the Danube Dam geo-technical system, is carrying optimal ecological conditions for plenty of xerothermophilous and psamophilous taxa. Therefore, there is an interesting question, if and how intensively this species of cricket will colonise some of the newly-formed areas of both ruderal and xerothermous character of Slovakia.

Key words: *Oecanthus pellucens*, infiltration, aridization, distribution, Danube, Slovakia.

1. Introduction

The tree cricket *Oecanthus pellucens* (Scopoli, 1763) belongs to the pontomediterranean species of orthopterous insects with the centre of its distribution being in central and western Asia, northern Africa, southern and central Europe, in xerothermous conditions. Although Bellmann (1985) considered southern France and south-western Germany as a northern boundary of its distribution on the European continent, Assa (1998) also confirmed its occurrence in southern Luxembourg. However, Gerend & Proess (1994) showed that its northern boundary seems to move according to actual climatic factors as well as other natural exogenous and endogenous or anthropogenous factors.

An area extension of any species happens as a result of it spreading and inhabiting new spatial niches. It can be understood as macrodynamic changes in space according to time periods of several thousands years. Those are postglacial changes of Slovakia with following fluctuations of observed species population dynamics. Microdynamic changes are shorter in time and happen regularly. They include invasions, infiltrations, emigrations, immigrations, permigrations, occupations, colonisations as well as

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dying out of species in its original territory. A natural barrier of distribution can often be reduced by anthropogenous impacts, as it is in the case of the tree cricket and the construction of the Danube dam geo-technical system in Slovakia.

2. Ecology

Occurrence of the tree cricket *Oecanthus pellucens* is markedly determined by xerothermous ecological conditions of steppe and woody steppe biotopes. Šušlík (1996) recorded this species in mesophilous vegetation as well. In any case, it is a frequent species in vineyards, especially in abandoned ones or those in bad maintenance (Zebe 1954). It occurs on vegetation, usually up to the height of 1 m, where it walks on stalks, leaves and flowers of higher plants such as *Achillea* L., *Stenactis annua* (L.) Nees, *Verbascum* L. or *Salvia* L. Occasionally, especially when threatened, it escapes onto the substrate. An arboricol way of life is rare, but can happen on lower bushes or trees, such as *Crataegus* L. and *Rosa* L. Harz (1957) recorded its occurrence on *Quercus* L., *Fraxinus* L. and *Rubus idaeus* L. Presence of the species on *Vitis vinifera* L. relates to its reproductive cycle, in terms of laying its eggs into the stem.

The main food is formed by flowers and remains of organic matter, but *Oecanthus pellucens* is usually pantophagous. Harz (1957) states that males start with alar stridulation three to five days after the last moulting. In weather without wind the sound is audible from distance of up to 50 m, occasionally up to 150 m (at mass stridulation), according to the number of individuals. Intensity increases from early evening hours and culminates at about 22.00. Busnel & Pasquinelly (1954) distinguish mating, concurrent and another type of stridulation display. Females later lay eggs to stem tissues of various plants, usually of *Vitis vinifera*. Harz (1957) also records species of genus *Mentha* L., *Cichorium* L. and *Agrimonia* L. Nymphs leave the tissue of *Vitis vinifera* in June.

3. Distribution and Infiltration in Slovakia

Distribution of *Oecanthus pellucens* in Slovakia was related to the distribution of vineyards, but recently we recorded the species in other types of habitats (infiltration). Wherever suitable conditions become available due to aridisation and other factors, *Oecanthus pellucens* expansively spreads to habitats climatically similar to the original ones, which is called progressive infiltration. We suppose that as soon as these new topical and climatic conditions disappear, the species will emigrate to its original area. At the same time its population density will decrease at unoriginal sites.

According to conditions in Slovakia, records about occurrence and distribution of *Oecanthus pellucens* are sporadic and are usually simple faunistic records. However, temperature factors determine northern boundary of its distribution along southern-exposed slopes of mountains close to lowlands of southern Slovakia. And although Harz (1957) stated that its distribution limit in terms of altitude was 300 m above sea level (a.s.l.), Nagy et al. (1998) recorded its occurrence in Zemplínske vrchy Mountains at an altitude of up to 400 m a.s.l. Occasionally, it can reach submountainous or mountainous regions. In August 2000 we observed it in xerothermous ecotone communities of forest edges near Morske Oko tarn in the Vihorlat Mountains at an altitude of about 700 m a.s.l.

Available sources about the occurrence of *Oecanthus pellucens* in areas of the Slovak Republic are included in following list and shown in Fig. 1. We mention locality, date, mapping square (according to the Database of fauna in Slovakia) and, in the case of publication, references as well. A “?” indicates that the date of the record is unknown.

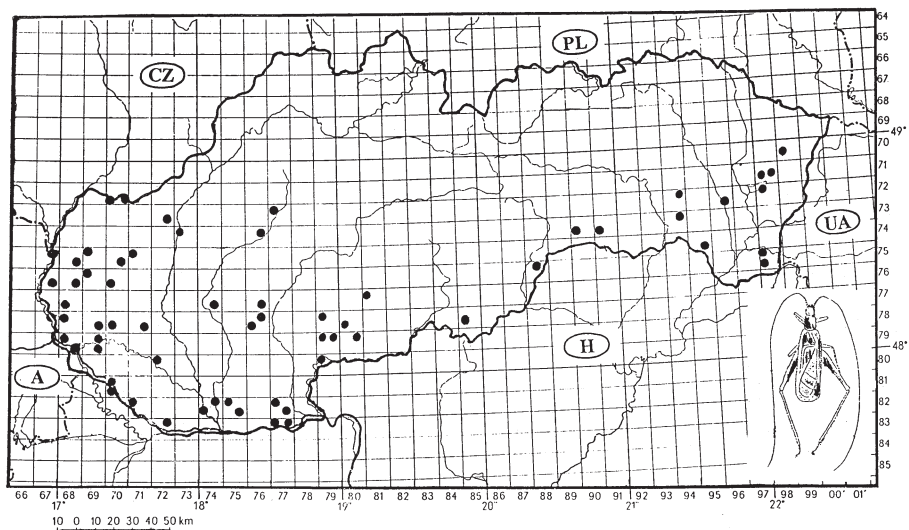


Figure 1. A Sketch of Known Distribution of the Tree cricket *Oecanthus pellucens* in Slovakia.

Ardovo, 15.8.1988, 7588b. Bidovce, 2.9.1994, 7296d. Bojnice, ?, 7277a (Brtek & Vachold 1962). Bratislava-Devínska Kobyla, ?, 7867b (Gulička 1974), 1994, 7867b (Holuša & Vidlička 1997). Bratislava-Kopac, 26.8.1983, 5.9.1990 (Majzlan 1992), 7868d. Bratislava-Mlynska dolina, 15.9.1987, 7868a. Buc, 15.9.1997, 8177d. Cachtice, 14.8.1975, 7272d. Cicov, 8-9.1986, 8272b. Cifare, 25.9.1998, 7776c. Devin, 28.8.2000, 7867a. Devinske jazero, 27.9.1991 7767b. Dobra voda, 15.8.1999, 7471a. Drienova hora, 7.-9.2000, 8176d. Dudince, 1998, 7879a (Krištín 1998). Gbelce, 9.9.1998, 8177a. Hajnacka-Pohansky hrad, 1995, 7785c (Šušlík 1996). Hrhov, 10.7.1990, 7390c. Hrkovce, 15. 6. 1999, 7979a. Hrusov, 1998, 7880b (Krištín, 1998). Hurbanovo-Aba, 13.9.1998, 8174b. Chalmová, ?, 7376b (Brtek & Vachold 1962). Chotín, 10.9.1991, 8175d. Istragov, 31.8.1999, 8171a. Ivanka pri Dunaji, 10.9.1999, 7869b. Jahodna, 20.8.1989, 7972a. Jakubov, 25.8.1997, 7567d. Jovsa, 16.8.2000, 7198d. Kamenicna-Balvany, 6.-8.2000, 8174 b. Katov, 16.9.1975, 7169c. Klokocov, 15.8.1961 (Gulička 1967), 17.8.2000, 7198c. Kralovsky Chlmec, 28.7.1989, 10.8.1995, 7598c. Krivostany, 12.9.1961, 7197a, (Gulička, 1967). Kuchyna, 13.8.1977, 7568d. Kusín, 1.10.1962, 7198c (Gulička 1967). Laksarska Nova Ves, 22.8.1996, 7469a. Leles, 15.8.1995, 7598a. Lozorno, 9.1977, 7668c. Luka, 29.7.1998, 7373a. Mala Maca, 18.10.1999, 7771d. Medovarce, 1998, 7780c (Krištín 1998). Miloslavov-Alzbetin dvor, 12.8.1990, 7869d. Mochovce, 22.9.1998, 7776b. Moravsky Svaty Jan, 3.8.1990, 7467a. Morske oko, 15.8.2000, 7099c. Muzla, ?, 8277b (Mařan 1954), 13.8.1996, 8277a. Nahac, 8.1974, 7471a. Nesvady, 20.8.2000, 8074b. Nitra-kalvaria, 14.9.1984, 7674d. Nitra-Zobor, 14.9.1984, 7674d. Oslany, ?, 7376b (Brtek & Vachold

1962) Pezinok, 9.1990, 7669d. Pila-Cervený kamen, 9.1990, 7570c. Plastovce, 1998, 7879b (Krištín 1998). Raca, 9.1979, 7768d. Rohozník, 10.8.1997, 7569a. Rykynce, 1998, 7779d (Krištín 1998). Senohrad, 1998, 7681a (Krištín 1998). Skalica-Vetreník, 10.9.1986, 7169d. Sladkovicovo, 18.10.1999, 7771d. Slanec, 5.9.1994, 7394b. Somotor, 28. 7. 1989, 7596d. Studienka, 30.8.1997, 7468d. Stupava, 29.8.2000, 7768a. Svätý Jur, 8-9.1989, 7769c. Trstena na Ostrove, 19.7.1998, 8071c, (Fedor, 2000). Trstín, 8.1974, 7470d. Turna nad Bodvou, 22.8.1988, 7391c. Velaty, 2.9.1984, 7495d. Vinne-Senderová, 1.8.1961, 7197d (Gulička 1967) Vinné-Vinný vrch, 26.7.1989, 7197d, Vojka nad Dunajom, 7.-9.1998, 7.-9.1999, 8070a (Fedor 1999). Vozokany, 22.9.1998, 7676d. Vysná Kamenica, 1997, 7294b (Nagy et al. 1998). Zavadka, 16.8.2000, 7298a. Zavod, 21.8.1978, 7468a.

Invasion of the tree cricket (*Oecanthus pellucens*) relates to the Danube dam construction and functioning. Monitoring of the ground water and the aeration zone in this area helped us to identify the real impact of the dam on biota. From the results presented by Lapin (1995) one can conclude that regional trends of air temperature and potential evapo-transpiration are unambiguously increasing. Within 90 years (1901-1990), air temperature rose by about 0.8°C, while potential evapo-transpiration increased by about 14%. Trend of precipitation totals, sunshine duration and relative air humidity was decreasing, precipitation dropped by 15%. Decrease of the underground water level, together with global warming, caused aridisation in south-western Slovakia, which has an impact on fauna and flora structure or composition.

Before the year 1998, the tree cricket was not a very frequent species amongst the orthopterous insects along the Danube river. But soon after the influence of the Danube dam geo-technical system became apparent, the species appeared more commonly and widespread. This infiltration was due to the formation of a new biotope structure, mainly of xerothermous character, that replaced large floodplain forest stands as a result of the construction of the dam. The new dam, which is under intensive management (mowing), as well as gravel terraces and ruderal sites provide the new suitable conditions for xerothermous plant communities, especially those of *Artemisieta vulgaris* Lohmeyer et al. in R. Tx. 1950 class. That is why there are the considerable changes in the zoocenose structure. The tree cricket became a dominant species in many orthopterous communities at these sites.

4. Discussion

In recent years there is wide evidence of many species invasions, due to changed ecological conditions in Slovakia. This phenomenon seems to be more frequent at present times than some time ago. The natural spreading is understood to be a recolonisation of Central Europe after the last glacial period, in the form of irreversible or cyclic changes of climate. Therefore climate becomes a factor responsible for these invasions. Of course the anthropogenic impact represents an important factor for invasions as well.

Invasions are of variable speed. After depletion of food resources and occupation of the spatial niches, the balance with natural enemies is established and invasion slows down and eventually stops.

We consider infiltration to be the fast process of colonising similar habitats and overcoming isolation barriers by species. Larger streams often represent such barriers:

in Slovakia these are, for example, the Danube, the Morava and the Tisa rivers. Mountain ranges seem to represent barriers for many soil beetles, if they are geobionts and without wings. Unlike invasion, infiltration is in fact a dynamic process. Therefore we suggest that there is progressive infiltration (inhabiting new biotopes) and regressive infiltration (emigration) back to original areas of the same species. In the case of invasion, species maintain a certain population density in a new area (*Leptinotarsa decemlineata* (Say, 1824), *Acheta domestica* (L., 1758)) also after change of topical area conditions. A certain time period is necessary for reliable determination of either infiltration or invasion. We tried to state the characteristics of infiltration for the population of the observed species *Oecanthus pellucens*.

Changes in natural units, deforestation, and the steppe formation represent the limiting factors for the observed species *Oecanthus pellucens*. Increased values of air temperature and potential evapo-transpiration or on the contrary decreased rainfalls leads to changes of coenological structure along the Danube river. Fauna is enriched in xerothermous species (*Oecanthus pellucens*). The decrease of the average abundance and the increase of bug species diversity, caused by a long lasting drought in 1993 and by changes in hydrological regime and following ruderalisation were observed here by Štepanovičová (1995).

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