ARTICULATA 2001 16(1/2): 21 - 26 BIOLOGIE

Seasonal Dynamics of the Tree Cricket *Oecanthus pellucens* (SCOPOLI, 1763) (Ensifera, Gryllidae) in South-Western Slovakia

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Abstract

During vegetation periods (V. - X.) of the years 1998 - 2000 the entomological material samples with 245 specimens of the tree cricket *Oecanthus pellucens* (SCOPOLI, 1763) (64 nymphs, 102 females, 79 males) were obtained using sweeping through vegetation method at chosen study sites of south-western Slovakia, along the Danube river. The results declare, that the first nymphs appear in nature in the half of June and persist there till the beginning of August. However generally it takes around one month to get mature and to become adults. The last moulting usually happened at the end of July and population density grows to its maximum during August and September and decreases relating to lower air temperatures soon after. Adults persisting till the beginning of October are often females laying their last eggs as an overwintering ontogenetical stage. Some differences in population dynamics are seemed to hint at climatic factors and anthropogenous impact of the Danube dam geotechnical system.

Introduction

Oecanthus pellucens represents a pontomediterranean species of cricket with its distribution area in southern and central Europe, northern Africa, in central and western regions of Asia. As for Europe, it was even recorded in southern Luxembourg (ASSA 1998).

Its distribution in Slovak republic was limited by presence of vineyards in past, although it was later observed in a wide range of xerothermous biotopes in southern Slovakia, especially of lowland character, and partially in central Slovakia as well (FEDOR & MAJZLAN 2000). And though HARZ (1957) connected its distribution with maximal altitude of 300 m above sea level, FEDOR & MAJZLAN (2000) recorded this cricket at forest stand margins in Vihorlat Mts., Slovakia at the altitude of app. 700 m above sea level. DETZEL (1998) mentiones its occurrence at the altitude of more than 1.000 m above sea level. However, *Oecanthus pellucens* prefers steppe and woody steppe formations with stand height of maximally 1 m. It often appears on stalks of various plants such as *Achillea* spp. L. and *Stennactis annua* (L.) Nees as well as frequent tussocks, where there are many individuals together.

Development takes one year only. Female lays its eggs into a stalk tissue of many plants, especially of grapevine. HARZ (1957) also recorded *Mentha* spp L., *Cichorium* spp. L. and *Agrimonia* spp. L. After overwintering the young nymphs

usually hatch at the beginning of June. After 6 instars adult individuals appear by July. Males start their stridulation 3 - 5 days after last moulting, usually between 6 and 10 p. m. and it is distinguished mating, concurrent and another type of stridulation (BUSNEL & PASQUINELLY 1954).

Material and Methods

The entomological material samples were collected using sweeping through vegetation method at chosen study sites of south-western Slovakia, along the Danube river during vegetation periods (V. - X.) of 1998 - 2000. According to measurements by Slovak Hydrometeorological Institute values of hydrometeorological characteristics within these periods were relatively similar to each other, for example in 1998 the average air temperature reached 10.8 °C, annual rainfalls 591 mm and relative humidity 73.1%.

In 1998 and 1999 sampling was done at 2 sites situated in south-eastern octant of cadastral area of Vojka pri Dunaji village, Slovakia (47° 58´ N, 18° 25´E), with optimal ecological conditions for the tree cricket and its high abundance. First of them (VD1) represents the associations of *Dauco-Crepidetum rhoeadifoliae* HEJNÝ et GRÜLL in HEJNÝ et al. 1979 and *Echio-Melilotetum* R.TX. 1947, that reflect relatively xerothermous character of their habitat. Vegetation physiognomy is designed by domesticated anthropophytic *Stenactis annua* (L.) Nees (in aspect of late summer), *Crepis foetida* ssp. *rhoeadifolia* L., in undergrowth with *Medicago lupulina* L., *Chrysaspis dubia* (SIBTH.) DESV. a *Ch. Campestris* (SCHREB. in STURM) DESV. The second study site (VD2) seems to be similar enough but anyways it represents an association of *Tanaceto-Artemisietum vulgaris* SISSINGH 1950, as a mature type of synanthropic vegetation, usually appearing ruderally. It sporadically forms a step of secondary progressive succession towards the floodplain forest community. Physiognomy is determined by *Stenactis annua* (L.) Nees, *Tanacetum vulgare* L. and *Artemisia vulgaris* L.. A plant species composition refers to development from habitat similar to the first site (VD1).

An additional sampling, as the checking data, took place in 2000, but at study site CV, several kms far from VD1 and VD2 and without possible impact of the Danube dam geotechnical system. It is represented by a xerothermous biotope with occurrence of individual trees, especially willows and poplars, on a gravel terrace, situated about 2 km on South-East from village of Čičov, Slovakia, (47' o 46´N, 17o 45´ E) and it is physiognomically similar to VD1 and VD2 sites. The plant community *Tanaceto-Artemisietum vulgaris* Sissingh 1950 appears to be a stage in a successive process towards the floodplain forest.

Samples of entomological material were obtained using sweeping through vegetation method with the help of sweeping net once a 2 to 3 week period, in the morning hours (9 - 11 a.m.) of sunny days with no wind, at time of relatively high activity of *Oecanthus pellucens* and its presence on vegetation stalks and leaves. Generally 200 swings per each sampling were carried out. Whole entomological material was stored in canvas pockets until separation of observed species in laboratory. According to TISCHLER (1949), who considered quantity of animals captured by sweeping net of 40 cm in diameter in 50 swings of sweeping range of 2 m as actual abundance occurring in area of 1 m^2, the sample (200 swings) represented an actual abundance in area of 4 m^2.

Results and discussion

Generally the obtained material consisted of 245 individuals: 64 nymphs, 79 males, 102 females of the tree cricket (*Oecanthus pellucens*). In 1998 123 specimens were captured together at both sites VD1 (76) and VD2 (47), and in 1999 it was 82 individuals (39 at VD1 and 43 at VD2). Later, in 2000, data were enriched by 40 specimen of the third site (CV). The highest number of *Oecanthus pellucens* individuals (76) refers to site VD1 in 1998, the lowest (39) to the same site in 1999. This could be caused by influence of local weather conditions, population fluctuations, anthropogenous impact or another factors. Site CV is excluded from this evaluation due to different frequency of obtaining samples (8) in comparison with 10 at sites VD1 and VD (12). There is an interesting fact, that in 1997 there were no specimens recorded at VD1 and VD2 sites, what can hint at infiltration of this species into the new habitats after construction of the Danube dam geotechnical system. GEREND & PROESS (1994) mention fact, that the tree cricket had been rediscovered in Luxembourg and even it had been considered as a very frequent species. SANDER (1995) recorded an expansion of its distribution area in Germany. Changes in distribution of the tree cricket in Bavaria due to changes in landscape are presented by WEID & BRICK (1990). Also, the ability to spread quickly and intensively, if environmental conditions are suitable, is observed by MEßNER (1991) in Germany The chosen ruderal biotops seem to be very suitable for this species, especially due to its food preferences. For example ZEHM (1997) writes about some of its favourite plants, which in fact occur at mentioned study sites. DETZEL (1998) mentiones some ruderal sites as the suitable biotops for the tree cricket in Germany.

The obtained results of the population dynamics of the tree cricket at chosen study sites in south-western Slovakia are accompanied by graphs (Fig.1 - 5). There are no considerable differences in quantity of females and males in the samples, their values are even equal (13) at site VD1 in 1999, but in fact there were not more males than females in any of 5 annual evaluations. A different sexility seems to hint at different ontogenetical dynamics of both sexes, hence females more probably persist in nature for a longer time and till a later vegetation period (beginning of autumn) due to finalizing reproduction cycle or especially egg lying. This research is supposed to confirm this assumption, because in fact there is not higher quantity of males in any obtained sample at any study site after August, except of site VD2 on the 18th of September, when the number of both sexes are indeed equal (2 specimens of each sex). On the other hand, SANDER (1995) recorded stridulating males in Germany in the second half of September, when their abundance began to decrease. However, statistical significance of a low number of specimens in case of research near the

Danube river (4 individuals) seems to be questionable enough to evaluate and to state some responsible conclusion.

According to obtained samples the population density varied between 0 and 4.25 individuals per 1 m^2 (August 25, 1998). The first nymphs appeared in the half of June till beginning of July. Population density of nymphs increases till around the half of July with maximal recorded value 3 nymphs per 1 m^2 at VD1 in 1998 (July, 19), when it starts to decrease rapidly. Generally nymphs occur in nature till the beginning of August. DETZEL (1998) recorded them in Germany in the middle of August.

Adults begin to appear in the first decade of July (July, 8 1999 at VD1 and VD2) until the same period of August (August, 7 1998 at VD1). July as a month of the first adults relates to records by HARZ (1957) as well as by DETZEL (1998). There is a trend of increasing population density of adults in population dynamics of the tree cricket with its peak (3.25 adults per 1 m^2) at the end of August (August, 25 1998). However this peak appears to be continual. The last adults were possible to be captured at the beginning of October. Some records of the tree cricket are mentioned from Luxembourg at the beginning of October 1997 by ASSA (1998), while DETZEL (1998) presents for Baden-Württemberg the end of September usually.

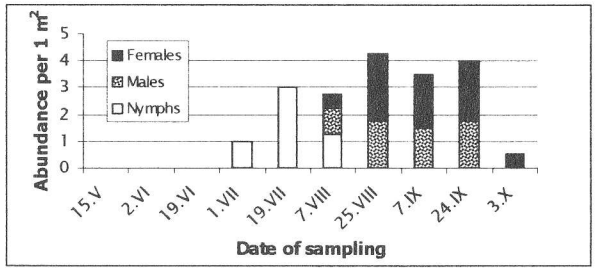

Fig. 1: Seasonal dynamics of *Oecanthus pellucens* at VD1 site in 1998

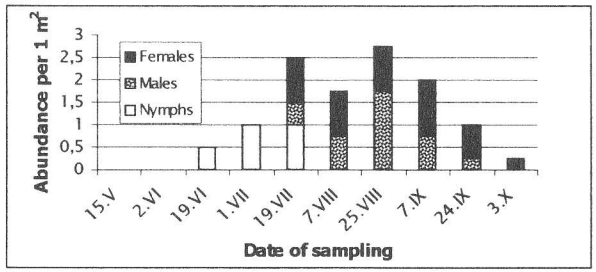

Fig. 2: Seasonal dynamics of *Oecanthus pellucens* at VD2 site in 1998

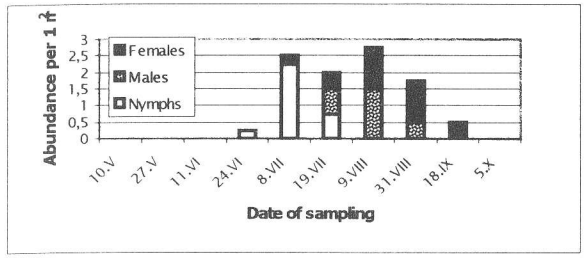

Fig. 3: Seasonal dynamics of *Oecanthus pellucens* at VD1 site in 1999

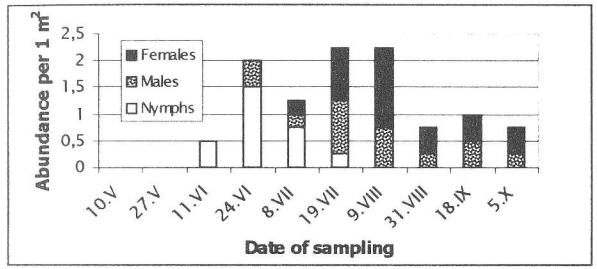

Fig. 4: Seasonal dynamics of *Oecanthus pellucens* at VD2 site in 1999

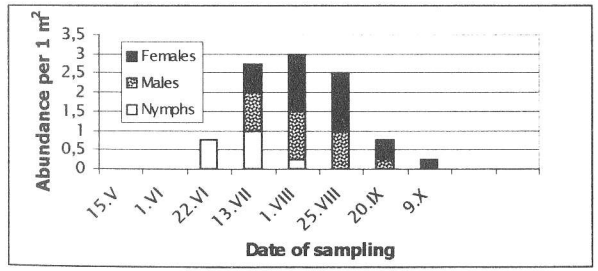

Fig. 5: Seasonal dynamics of *Oecanthus pellucens* at CV site in 2000

From the results presented by LAPIN (1995) it follows, that regional trends of air temperature and potential evapotranspiration along the Danube river in Slovakia are unambiguously increasing. Within 90 years (1901-1990), air temperature rose by about 0.8 °C, while potential evapotranspiration increased by about 14 %. However, either these reasons or aridisation caused by antropogenous impact due to the Danube dam geotechnical system construction and functioning form the suitable conditions for extending distribution area of the tree cricket,

respectively its infiltration to newly-established habitats. Anyways not only climatic but even factors of actual weather can influence population dynamics of species. Considerably dry and warm year 1999 and early droughts in spring and at the beginning of its summer moved whole ontogenetical cycle of the tree cricket about 2 weeks or more earlier than in 1998. For example there is a top of population density at the end of August in 1998 and at the beginning of this month in 1999 as well as in 2000.

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