Abstract – A small introduced population of Eupholidoptera garganica La Greca, 1959 (Orthoptera: Tettigoniidae: Tettigoniinae: Pholidopterini) was found in a garden suburb of Albertfalva, part of Budapest. Altogether 8 singing males were detected in July 2018, on a less than 2 hectare area. The origin of the population is unknown; the species arrived most probably accidentally with horticultural plants from Italy. With 4 figures.

Key words – established population, faunistics, introduced species, urban environment

INTRODUCTION

The anthropogenic spread of insects is a world-wide phenomenon (e.g. Kenis et al. 2009). In Hungary 170 invertebrates are regarded as invasive species (Báldi et al. 2017), however, the number of alien taxa is obviously much higher. In the insect order Orthoptera only two introduced species were known until now: Diestrammena asynamora Adelung, 1902 (Jablonowski 1914, Nagy 1988) and Meconema meridionale (Costa, 1860) (Sziráki 1996, Nagy 2001).

Eupholidoptera Ramme, 1951 is a genus of colourful, flightless but quick jumping bush crickets belonging to the subfamily Tettigoniinae and to the tribe Pholidopterini. The genus contains 52 species and 6 subspecies distributed in Southern Europe and in the Middle East (Cigliano et al. 2018). Çiplak et al. (2009, 2010) gave the most comprehensive revision and phylogeny of the genus based on morphology and bioacoustics. They concluded that main character source is the male genitalia and, contrary to other genera of Pholidopterini, male calling songs are relatively invariable.

None of the species of the genus is native in Hungary. The area of E. schmidti (Fieber, 1861) reaches north Croatia, the closest known native populations to the Hungarian border are in the Papuk Mountains (Szövényi & Puskás 2012).
and in the Žumberak-Samoborsko gorje Nature Park (NAGY 2006). An allochthonous population of this species was found in 2011 also in Austria, in the village Mödling south of Vienna (REITMEIER 2014). The occupied area of this population was found to be increasing in the following years (ZUNA-KRATKY 2017).

A closely related species is Gargano Marbled Bush-Cricket, *E. garganica* La Greca, 1959 (Fig. 1). It has a peculiar distribution, occurring in southeastern Italy (Puglia), southern Albania and the northwest of Greece (Corfu and Epirus) (KALTENBACH 1967, WILLEMSE 1980, ALLEGRIUCCI et al. 2014). The species is assessed as Near Threatened on the IUCN Red List because of its restricted area, the continuing decline in the extent and quality of its habitat and in the number of mature individuals, as well as the increasing wildfire frequency within its range (HOCHKIRCH et al. 2016).

Both of the mentioned taxa are sometimes regarded as subspecies of *E. chabrieri* (Charpentier, 1825) (e.g. WILLEMSE 1980). LEMONNIER-DARCEMONT (2007) also debated the species status of *E. schmidti*, based on her hybridisation experiments with nominotypical *E. chabrieri*. Despite these, recently all taxa are mostly regarded as separate species. This view was concluded also in the revision

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**Fig. 1.** Habitus photo of Gargano Marbled Bush-Cricket (*Eupholidoptera garganica* La Greca, 1959) from Albertfalva, Budapest, Hungary (all photos by G. Puskás)

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of the western species of the genus by Allegrucci et al. (2014) based on morphological and molecular data.

MATERIAL AND METHODS

First specimens of *E. garganica* were observed acoustically in Budapest in the night of 19th July 2018. Next evening a systematical visit of the surrounding streets was done and localities of singing males were recorded. One male was captured, preserved in 96% alcohol, and deposited as voucher specimen in the Collection of Smaller Insect Orders of the Hungarian Natural History Museum (HNHM, Budapest).

After dissecting, the titillator was boiled in 10% potassium hydroxide solution. Focus stacking photos (Fig. 2) were taken with a Nikon D5200 camera with

![Image](image_url)

**Fig. 2.** Male titillator (dorsal and lateral view) of *Eupholidoptera garganica* La Greca, 1959 from Albertfalva, Budapest, Hungary. Scale bar = 1 mm
Mitutoyo M Plan Apo 5× microscope lenses, individual images were stacked with Zerene Stacker software.

Revisions of Willemse (1980) and Allegrucci et al. (2014), as well as comparative material of the HNHM were used for the identification.

RESULTS


All the locations are in a suburb with roadside bushes and trees, small gardens and parks (Fig. 3). Eastwards next to the newly found population there is a large green area with also suitable habitats for the species (between Karcag Street and Szerémi Street, Fig. 4). However, this area was not open for the public and we were not able to study.

Proposed Hungarian name of E. garganica: garganói bozótszőcske.

DISCUSSION

Altogether eight singing males of E. garganica were detected in Budapest in the summer of 2018. The size of the inhabited area was below 2 hectares, but the population possibly stretched also into the large closed park next to the known localities. Thus the estimated population size was a few tens of specimens. The probable time of colonization of this area could not be later than one or two years before 2018.

The origin of the population is unknown. E. garganica could travel to Budapest accidentally with garden plants. The most probable source country is Italy as Hungary has a significant horticultural import from there (Jankuné Kürthy et al. 2010). A few data of Mediterranean Orthoptera were already reported from Hungarian horticultures and gardening nurseries where intensive plant transport is going on from Italy (Bodor 2016, personal communications of F. Bognár, K. Gál, D. Horváth and Sz. Tóth). Another possible way to reach Budapest is with the help of tourism. Both the Italian and the Greek coasts are popular target places of summer holidays and an accidental translocation of a single female specimen with fertilised eggs could have been enough to establish a population. However, an intentional capture and either deliberate or accidental release of some specimens of this colourful bush cricket also cannot be excluded.

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Fig. 3. Abádi Square in Albertfalva, Budapest, Hungary, habitat of *Eupholidoptera garganica* La Greca, 1959

Fig. 4. Map of the suburb in Albertfalva, Budapest, Hungary, where a population of *Eupholidoptera garganica* La Greca, 1959 was found. Yellow dots show the stridulating male specimens on July 20, 2018. Between Karcag Street and Szerémi Street there is a large closed area with suitable habitats, which was impossible to study.
Speculating the origin of the similarly allochtonous population of *E. schmidti* in Austria, the most probable theories were that the species was introduced with plants from greenhouses or perhaps by trains passing from the south (Reitmeier 2014, Zuna-Kratky 2017).

Winter temperature could be a limiting factor of the survival, but presumably it is not very strict as these bush crickets overwinter in eggs. Once there was an *E. schmidti* record also in Budapest: some specimens fully developed in 2014 from outside overwintered eggs of an escaped individual with Croatian origin in the garden of the Plant Protection Institute of the Hungarian Academy of Sciences (B. Nagy, personal communication). The latter observation confirms that climate of the suburbs seems to be suitable for these Mediterranean species due to the heating effect of the city.

Winter frosts, human disturbance (e.g. traffic), isolation and inbreeding can be crucial factors for the future of the Budapest *E. garganica* population, which would be an interesting target of further studies in the next years. Monitoring could result not only new data for the knowledge of this species but also more general information for the biological invasion and urban ecology.

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**REFERENCES**


