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Three species of Mountain Cicadas (Cicadetta montana complex) found in Hungary with bioacoustic methods (Hemiptera: Cicadidae)

T. Trilar[1*] & M. Gogala[2]

[1] *Slovenian Museum of Natural History, Prešernova 20, P.O.Box 290, SI–1001 Ljubljana, Slovenia. E-mail: ttrilar@pms-lj.si*
[2] *Slovenian Academy of Sciences and Art, Novi trg 3, SI-1000 Ljubljana, Slovenia. E-mail: matija.gogala@guest.arnes.si*

Abstract – The fauna of singing cicadas (Hemiptera, Cicadidae) of Hungary was investigated on a single two-day field trip in May 2011 with bioacoustic methods, using recording equipment for ultrasonic range. Three species of Mountain Cicadas, *Cicadetta brevipennis* Fieber, 1876, *Cicadetta montana* (Scopoli, 1772) s. str. and *C. cantilatrix* Sueur et Puissant, 2007 were found, which represent the first acoustically proven records for Hungary. With 3 figures.

Key words – Bioacoustics, Cicadidae, *Cicadetta montana*, *Cicadetta brevipennis*, *Cicadetta cantilatrix*, Hungary.

INTRODUCTION

According to Soós (1956) *Cicadetta montana* (Scopoli, 1772) s. lat. was found in Hungary at the following localities (in alphabetical order): Budakeszi, Budapest (Buda Hills, Hűvösvölgy, János-hegy, Remete-hegy, Vadaskert), Isaszeg, Kaposvár, Nadap, Pécs (Jakab-hegy), Pomáz, Sátoraljaújhely and Sukoró, while *Cicadetta montana* var. *megerlei* Fieber, 1872 was mentioned from Budakeszi and Pilisszentlélek (Fekete-erdő) (Soós 1956). Recent research shows that *Cicadetta montana* is a complex of species,

* Corresponding author

members of which can be separated with certainty only by bioacoustic methods (Figs 1–3) and/or molecular characters (PUISSANT & BOULARD 2000, GOGALA & TRILAR 2004, GOGALA 2006, SUEUR & PUISSANT 2007*b*). On a short two-day field trip to Hungary we visited three localities, and found three species of Mountain Cicadas, which represent by the first acoustically proven records.

MATERIALS AND METHODS

During our fieldwork on 26–27 May 2011, we investigated with bioacoustic methods the areas of Szent György Hill (Szent György-hegy) at Hegymagas, north of Lake Balaton, János Hill (János-hegy) in the Buda Hills, Budapest and Meleg Hill (Meleg-hegy) at Nadap, in the Velence Mountains north of Lake Velence. We devoted special attention to the species of the *C. montana* complex.

For sensitive detection of high pitched sounds of Mountain Cicadas we used in this study an ultrasonic microphone (Pettersson) mounted on a Telinga parabola (diameter 57 cm) and Renault 4 car headlight parabola (diameter 15 cm) connected to an ultrasonic detector Pettersson D-200 in combination with Solid State recorders Marantz PMD660 and PMD670.

The recordings were transferred to the hard disk of a computer. Software used for viewing, editing and analysing the song signals was WavePad (NHC Software), Amadeus Pro 2 (HairerSoft) and Seewave package (SUEUR *et al.* 2008) as a part of R software platform (R DEVELOPMENT CORE TEAM 2008).

The sound recordings are stored in the Slovenian Wildlife Sound Archive housed in the Slovenian Museum of Natural History. Selected samples are available also on the web page *Songs of the European singing cicadas* (GOGALA 2007).

RESULTS

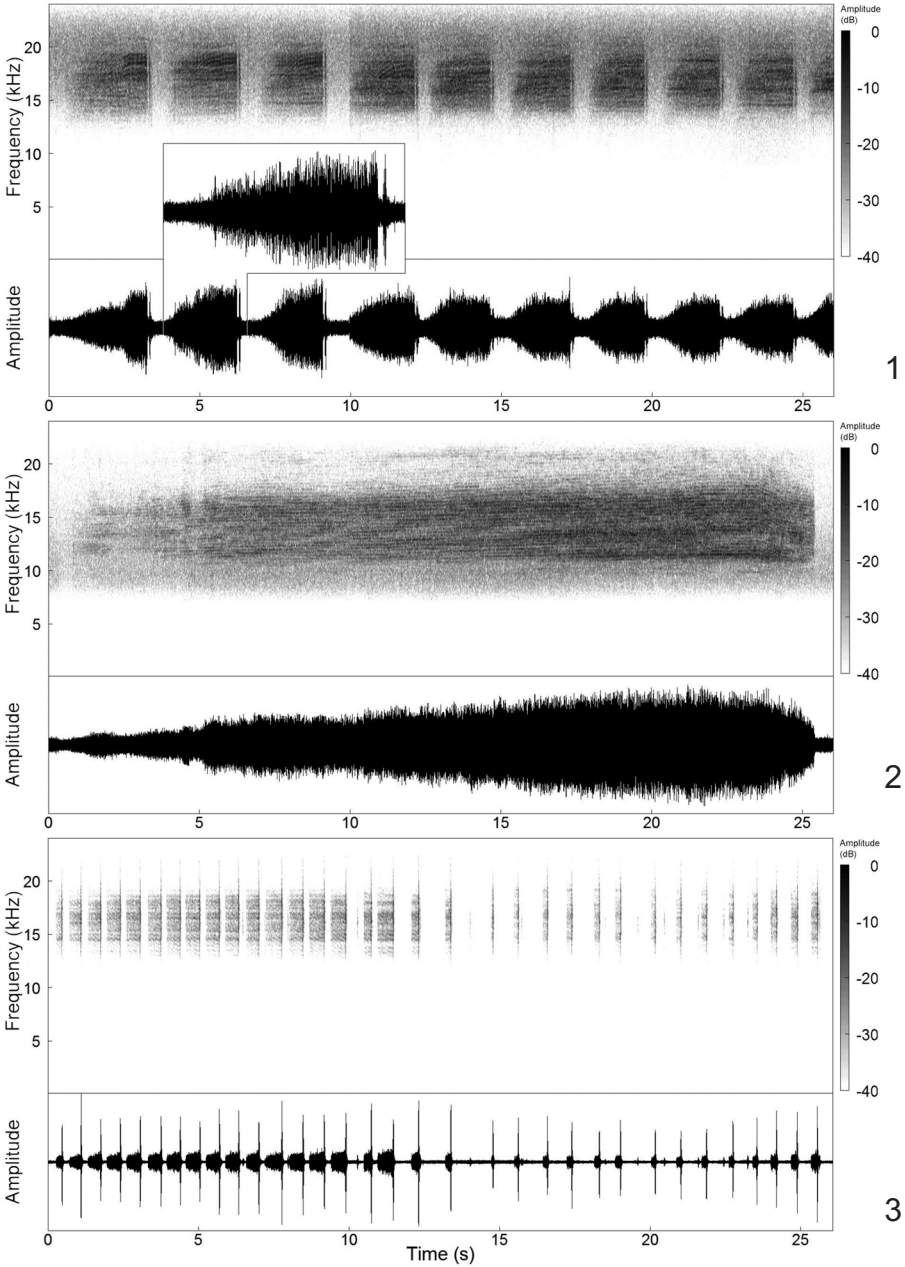
Faunistic data are as follows (all species were acoustically recorded):

Cicadetta brevipennis FIEBER, 1876 – Veszprém county, Hegymagas, Szent György-hegy; 310 m; lat. N 46°50.435', long. E 17°26.735'; 26.V.2011 (Fig. 1).

Cicadetta montana s. str. (SCOPOLI, 1772) – Budapest, János-hegy; 462 m; lat. N 47°30.225', long. E 18°57.264'; 27.V.2011 (Fig. 2).

Cicadetta cantilatrix SUEUR et PUISSANT, 2007 – Fejér county, Nadap, Meleg-hegy; 320 m; lat. N 47°15.284', long. E 18°35.110'; 27.V.2011 (Fig. 3).

On 26 May 2011 we first visited Szent György Hill (Szent György-hegy) north of Lake Balaton, where we listened to cicadas along the "Basalt Organ Pipes" Nature Trail ("Bazaltorgonák" Tanösvény), and on the eastern slope in a dense mixed deciduous forest we first heard and then recorded only one individual of *C. brevipennis*.



Figs 1–3. Comparison of song patterns as spectrograms and oscillograms in the same time scale: 1 = *Cicadetta brevipennis* FIEBER, 1876 from Szent György-hegy, 2 = *C. montana* s. str. (SCOPOLI, 1772) from János-hegy, 3 = *C. cantilatrix* SUEUR et PUISSANT, 2007 from Meleg-hegy

Next day, on 27 May 2011, in the morning we visited János Hill (János-hegy) in the Buda Hills, Budapest. On the southern slopes near Normafa mixed deciduous forest clearings with extensive meadows were located. At the forest edge around these meadows intensively singing males of *C. montana* s. str. were heard. We detected at least 20 singing males and recorded some of them.

The same day in the afternoon we visited also Velence Hills north of Nadap and Sukoró. On the thermophilous meadows overgrown with bush on the southern slopes of Meleg Hill (Meleg-hegy) we found a stable population of *C. cantilatrix*. Also at this locality the males were singing intensively, and we detected at least ten singing males.

DISCUSSION

According to our knowledge, these are the first acoustically proven records in Hungary for all three species of Mountain Cicadas.

These three species are known from some neighbouring countries: Slovenia (GOGALA & TRILAR 2004), Austria (TRILAR & HOLZINGER 2004) and Romania (TRILAR, GOGALA & POPA 2006, TRILAR & GOGALA 2008), while Croatia, Serbia, Slovakia and Ukraine are not sufficiently explored. The species listed above are also known from France (SUEUR & PUISSANT 2007*a*, *b*), Switzerland (HERTACH 2007), Italy (TRILAR & HERTACH 2008), Bulgaria (unpublished data) and Macedonia (GOGALA *et al.* 2005). At least two of them are known also from Germany (MEINEKE 2010) and Poland (TRILAR, GOGALA & SZWEDO 2006).

Therefore, occurrence of *C. montana* s. str., *C. brevipennis* and *C. cantilatrix* in Hungary is not surprising. However, it is possible that some other species of this species complex will be discovered in the future also in Hungary, such as *C. macedonica* (SCHEDL, 1999) or *C. concinna* GERMAR, 1821. *C. macedonica* occurs in Romania (TRILAR & GOGALA 2008), Bulgaria (unpublished data), Macedonia (GOGALA *et al.* 2005) and Greece (GOGALA *et al.* 2008). *C. concinna* is known from Poland (TRILAR & GOGALA 2007), Ukraine (NAST 1972) and Macedonia (GOGALA *et al.* 2005).

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