

Southern Cricket *Eumodicogryllus bordigalensis* (Orthoptera: Gryllidae) in the Czech Republic: new records and notes on the biology and stridulation

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ABSTRACT. Recently, the population of *Eumodicogryllus bordigalensis* consisting of more than ten males has been observed in Novosedly railway station in the most south-eastern part of the Czech Republic during 2004-2006. The individuals occupied railway embankment composed of coarse grit. Single male was found on other place at Mušlov sand pit. In southern Moravia, this species probably occurs on the northern edge of its range. The adults occur from the beginning of June to the beginning of September. The calling song of males of *E. bordigalensis* from Novosedly consists of long, uninterrupted sequence of syllables which lasts several minutes. The normal duration of syllables were 0.122-0.149 s, they are consisted of 11-13 impulses and the carrier frequency shows a band between 4.6-15.5 KHz.

KEY WORDS: *Eumodicogryllus bordigalensis*, distribution, faunistics, bionomics, stridulation, Czech Republic.

INTRODUCTION

Eumodicogryllus bordigalensis (LATREILLE, 1804) (syn. *Tartarogryllus bordigalensis*) is a xerothermic species living on forest-steppes and steppes. It is widespread throughout

N Africa, Spain, S Europe and S part of C Europe to Caucasus. There are four subspecies. The nominotypical one occurs in Central Europe (KOČÁREK et al. 2005), where it reaches the northern edge of its distribution.

E. bordigalensis had not been observed in the Czech Republic since 1962 and only a single record has been known from the Pavlovské vrchy hills (CHLÁDEK 1973). It resulted in the consideration that this species is vulnerable (CHLÁDEK 1995). Recently it has been repeatedly found in southern Moravia. In this paper, data on bionomics and stridulation from the Czech Republic are given.

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METHODS

The position of singing males was detected acoustically, but the individuals were very watchful and in case of any disturbance they escaped into crevices. To collect specimens the method of paralysing by commercial insecticide Hmyzovrah® (tetramethrin 0.08%, piperonyl butoxit 0.1% in propan-butan aerosol) was used. The insecticide caused a short-time rigidity which enabled easy collecting. During few minutes the paralysed crickets again became alive.

Two short lines of six pitfall traps were used in 2005. They were filled with beer, stabilized with ethylene-glycol and placed between railway tracks on 9.06.2005. They were checked on 11.06, 13.06, 17.06, 27.06. and 3.08.2005.

For sound recording the mini-disc recorder SONY MZ-R909 with high sensitive hand made microphone (frequency response up to 20 kHz) were used. The song was recorded at the laboratory conditions under the temperature of 26 °C. For analysis songs of three isolated males collected in Novosedly (17.07.2006, see below) were used. After digitizing the songs on PC, oscillograms and sound analysis were made with help of the software Sound Ruler ver. 0.941 (GRIDY-PAPP 2004). Frequencies below 500 Hz were filtered out. Durations of song characters were calculated from the sets of 50 measurements.

Bioacoustic terminology: calling song – song produced by an isolated male; syllable – the sound produced by one complete up and down stroke of the forewings; impulse – a simple, undivided, transient train of sound waves.

All measurements were taken by means of a stereo-microscope with a graduated eyepiece.

RESULTS AND DISCUSSION

Occurrence (Fig. 1)

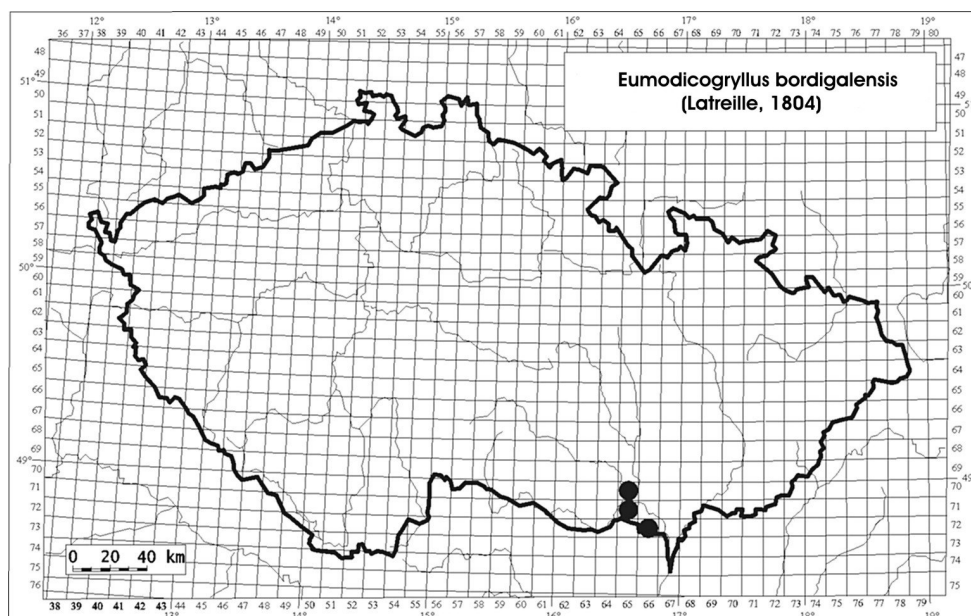


Fig. 1. Occurrence of *Eumodicogryllus bordigalensis* in the Czech Republic.

Pavlovské kopce (grid mapping square 7165-7164; see PRUNNER, MÍKA (1996)), August 1962, 1 male, leg. Dezort (CHLÁDEK 1973);

Novosedly (7164), 171m asl, 48°49'652" N, 16°30'915" E, railway station, 11.06.2004, 1 singing male, det. Vlk; 7.06, 9.06., 13.06., 17.06., 27.06., 3.08.2005, more than 10 singing males, det. Vlk; 15.07.2005, 8-12 p.m., more than 10 singing males, 6 males, leg., det. et coll. Holuša et Kočárek; 16.07.2005, 10 a.m., 1 singing male; 20.08.2005, 4 singing males; 22.07.2006, 5 singing males, all det. Holuša et Kočárek.;

Mušlov (7266), 190-200m asl, 48°47'269"N, 16°40'4685"E, sand pit, 2.09.2005, 1/0, leg. et coll. Marhoul, det. Kočárek et Holuša, under little stone in the upper part of the sand pit, only single singing male was observed at 7 p.m.

Recently the population consisting of more than ten males has been observed in Novosedly railway station (Fig. 2) although in other stations – Sedlec, Mikulov, Březí and Dobré Pole no singing male was found on 20.08.2005 and 22.07.2006 from 10 to 12 p.m. Only several males were caught with help of the insecticide or collected individually by



Fig. 2. Railway station in Novosedly – habitat of *Eumodicogryllus bordigalensis*.

digging and catching to the entomological net. The individuals occupied railway embankment composed of coarse grit (3-6 cm) (Fig. 3). They occurred only in part of railways station with more than one track. Males were often singing in crevices of the upper layer of grit, especially near the rails. No individuals (neither adults nor nymphs) were caught into the pit-fall traps, so it may be considered that the crickets do not move on the surface even during nights. Several authors (REDTENBACHER 1900, FRUHSTORFER 1921, BELLMANN 1993) reported their preference for open dry places, but stony places are probably typical for this species (see also FRUHSTORFER 1921, VAN ELST & SCHULTE 1995). It is very remarkable that VAN ELST and SCHULTE (1995) found very similar size of population, e.g. 10-12 individuals on the studied station.

The adults probably occur from the beginning of June to the beginning of September (see also VAN ELST & SCHULTE (1995)), but the abundance decreases considerably in the second part of August. Recently a big expansion of this species along the railway embankments is observed in Lower Austria (Zuna-Kratky, pers. comm.) although



Fig. 3. Detail of microhabitat - coarse grit.

E. bordigalensis was published only once by BERG and BIERINGER (1998) with first proven occurrence in Austria in 1994. There are some specimens in W. Kühnelt's collection from Illmitz from 1970 or earlier (Zuna-Kratky, in litt.). This is probably a well documented expansion which resulted in a new population in Novosedly but we can not omit from the permanent population in Pavlovské vrchy hills. This idea could be supported by the record at Mušlov sand pit. In southern Moravia this species probably occurs on the northern edge of its range (Fig. 1).

Southern cricket was found to inhabit the railway embankment, which is probably its ideal habitat - warm, dry and with many possibilities to cover. It occurs in variety of dry and warm habitats as BERG and BIERINGER (1998) recorded. It also lives on crackled river alluvium, gravel pit, loam pits and even flooded sand-pit. It often lives together with *Melanogryllus desertus* (PALLAS, 1771) (NADIG 1991).

Coloration, macroptery and body length

The body coloration of specimens from Novosedly is a bit different from the coloration generally presented in literature (KOČÁREK et al. 2005), where the species is usually described as ochreous to brownish. Our specimens are darker; the basic colour is brown or



Fig 4. Singing male of *Eumodicogryllus bordigalensis*.

blackish-brown (Fig. 4) and corresponds with colour of the substrate (coarse grit). The coloration is usually used as key determination sign (e.g. KOČÁREK et al. 2005) and correct identification by non-specialists could fail due to that. In contrary, VAN ELST and SCHULTE (1996) also found crickets living in railway embankment with dark stones, but the individuals were light.

One male collected in Novosedly was macropterous with one hind wing developed and the second wing broken off. The length of the hind wing was 9.8mm. CORAY (2002) observed cases of autotomy of the hind wings in macropterous *E. bordigalensis* from Switzerland. The author found, that the progeny of a mating pair were exclusively macropterous in the adult stage and later the wings were lost (in 3 to 5 weeks after adult moult). Then these individuals did not differ from normal non-macropterous ones. This macropterous male suggests the occurrence of similar hind wing autotomy in studied population. That is why we cannot evaluate the occurrence of macroptery without laboratory breeding. The macroptery demonstrates the capacity of flight, suggesting a vagility.

KOČÁREK et al. (2005) summarized that the length of body varies between 11.0-13.5mm and length of tegmina 6.4-7.5mm in males. Collected seven specimens show similar data: length of body 11.9-14.0mm (13.27 ± 0.67), tegmina 6.7-7.5mm (7.18 ± 0.27).

Stridulation

The calling song of males of *E. bordigalensis* from Novosedly consists of long, uninterrupted sequence of syllables which lasts several minutes. The normal duration of syllables were 0.122-0.149 s ($r=0.132$ s) and they are consisted of 11-13 impulses (Fig. 5); among the normal syllables the shorter syllables were irregularly inserted (duration 0.023-0.088 s; 1-7 impulses) (Fig. 5). The intervals between the syllables were 0.120-0.530 s ($r=0.300$ s). The carrier frequency of the song shows a band between 4.6-15.5 KHz (Figs. 5 and 6). The song has low intensity (e.g. in comparison with *Gryllus campestris* LINNÉ, 1758) and it could not be usually heard from the distance longer than 10m. Crickets have night stridulating activity. First males started to sing at the late afternoon (at 7 p.m. 15.07.2005) and regularly stridulated from the sunset to the midnight which corresponds with field observation.

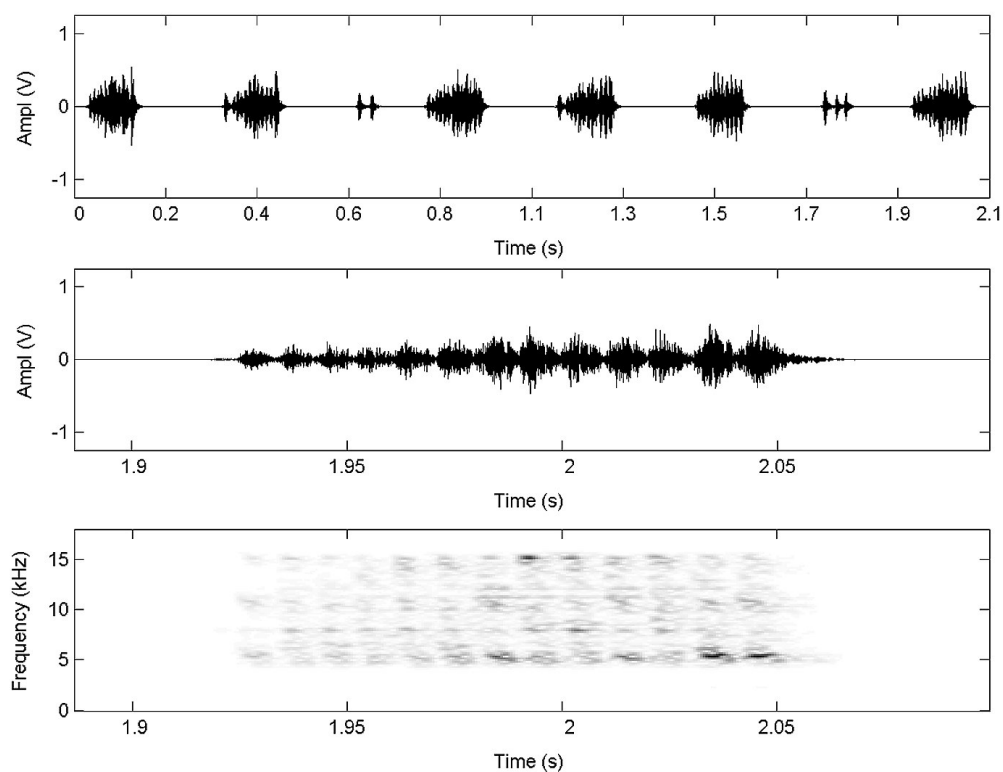


Fig. 5. Oscillograms and spectrogram of the male calling song of *Eumodicogryllus bordigalensis*.

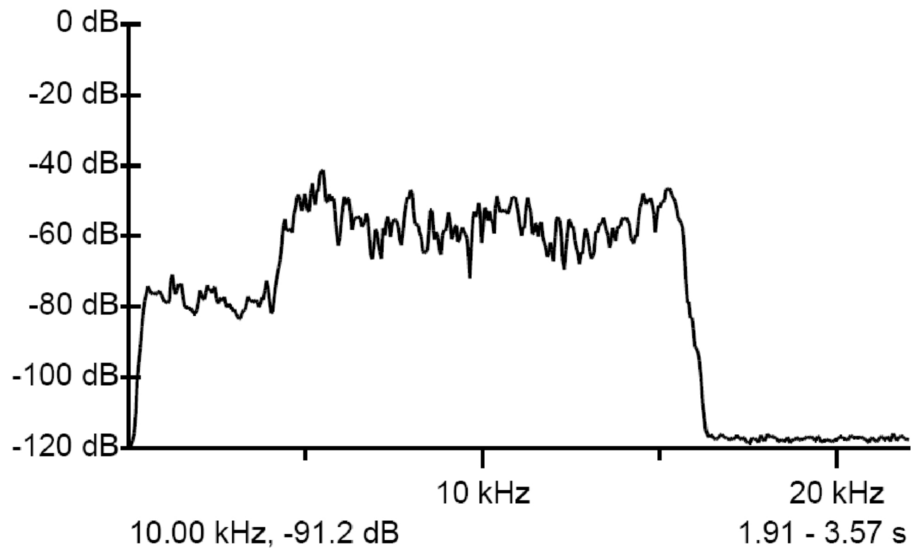


Fig. 6. Frequency spectra of the male calling song of *Eumodicogryllus bordigalensis*.

The oscillograms of the song of *E. bordigalensis* was previously published and commented by RAGGE and REYNOLDS (1998). The song of *E. bordigalensis* from France and Italy described by these authors slightly differs from our results. The authors found calling song consists of syllables repeated at the rate of about 2.5-4.0s and each composed of about 14-20 impulses. Each syllable lasted about 0.150-0.270s. The frequency of the carrier wave was 3.5-5 kHz. The differences can show to little local differences in song structure. For the comparison it is required to have material from more parts of the distributional area. The divergence of songs can be also caused by recording in lower temperature, when these authors used recordings in temperatures of 15°C and 22°C.

RAGGE and REYNOLDS (1998) also summarised older references to song of *E. bordigalensis*. More recently, the song was briefly described also by VAN ELST & SCHULTE (1995) and BENNET-CLARK and BAILEY (2002). VAN ELST and SCHULTE (1995) mentioned that the song is regular and consists of 2 syllables/s at 17 °C and 1 syllable/s at 12 °C. BENNET-CLARK and BAILEY (2002) described the song as short trills with dominant song frequency at 5 kHz.

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