

Vibrational signals of the pygmy grasshoppers males (Orthoptera: Tetrigoidea) from Laos and Southern Vietnam

Вибрационные сигналы самцов тетригид (Orthoptera: Tetrigoidea) из Лаоса и Южного Вьетнама

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KEY WORDS: Orthoptera, Tetrigoidea, *Paratettix*, *Bolivariettix*, *Criotettix*, vibrational signals.

КЛЮЧЕВЫЕ СЛОВА: Orthoptera, Tetrigoidea, *Paratettix*, *Bolivariettix*, *Criotettix*, вибрационные сигналы.

ABSTRACT. Vibrational signals of the males of *Paratettix hirsutus* Brunner-Wattenwyl, 1893 (Tetriginae), *Bolivariettix chinensis* (Hancock, 1912) (Metrodorinae) and *Criotettix bispinosus* (Dalman, 1818) (Scelimeninae) are described in first time. Oscillogramms all species and sonogram of *P. hirsutus* are presented.

РЕЗЮМЕ. Впервые описаны вибрационные сигналы самцов *Paratettix hirsutus* Brunner-Wattenwyl, 1893 (Tetriginae), *Bolivariettix chinensis* (Hancock, 1912) (Metrodorinae) и *Criotettix bispinosus* (Dalman, 1818) (Scelimeninae). Приведены их осциллограммы и сонограмма *P. hirsutus*.

Introduction

Vibrational signals of 9 species pygmy grasshoppers from Russia, Ukraine and Kyrgyz belonging to the nominative subfamily Tetriginae (Orthoptera, Tetrigoidea, Tetrigidae) are registered and described by the author [Benediktov, 1998; 2005]. Tetrigids produce species-specific vibration by middle legs, and also use body tremulation and disclosure of wings, that is considered to be non species specific vibration. These signals and their combinations can be complex-organized. Also vibrational signals of three species Tetrigidae from Eastern and Western

Europe are described by our colleagues in recent years [Pushkar, 2009; Kočárek, 2010; Kočárek at al., 2011].

Description of vibrational signals for three species from Laos and South Vietnam are given below for the first time. Each of the three species is belonging to three different subfamilies: Tetriginae, Metrodorinae and Scelimeninae. All signals are produced by middle legs only.

Materials and methods

Vibrational signals Tetrigidae are studied from the following geographical points: Laos, Vang Vieng, IX 2009 (V.A. Gromenko) (hereinafter referred to Vang Vieng.); South Vietnam, Park Kattien, 20–24 XI 2007 (A.A. Polilov) (hereinafter Kattien).

Vibrations are recorded a minidisk-recorder Sony MD Walkman MZ-RH910 (20–20000 Hz) with piezoelectric adapter (30–12000 Hz), the head of the adapter contacted with cardboard plates 75x90 mm slightly springing. Insects were placed on the cardboard.

The following terminology was used: the phrase — a complex signal of the series and pulses; series — a sequence of pulses, separated from other similar series with long pauses; pulses — elementary parcels, characterized by fast growing and rapidly decreasing amplitude.

Table. Characteristics of the vibrational signals of the pygmy grasshoppers.
Таблица. Характеристики вибросигналов тетригид.

Species of Tetrigidae	Duration of series, s	Pulses number in series	Repetition period of pulses, ms	Pulses number after series
<i>Paratettix hirsutus</i>	0.25	5–10	20–50	1–4
<i>Bolivariettix chinensis</i>	1.84–2.26	18–27	44–72	—
<i>Criotettix bispinosus</i>	0.81–1.89	13–31	51–78	—

Signal descriptions

Subfamily Tetriginae

Paratettix hirsutus Brunner-Wattenwyl, 1893

MATERIAL: ♂ (Vang Vieng). Temperature during recording of +23...+25°.

Vibrational signals of the single male (Figs 1–4; Table) is complex phrase with duration 316–515 ms and

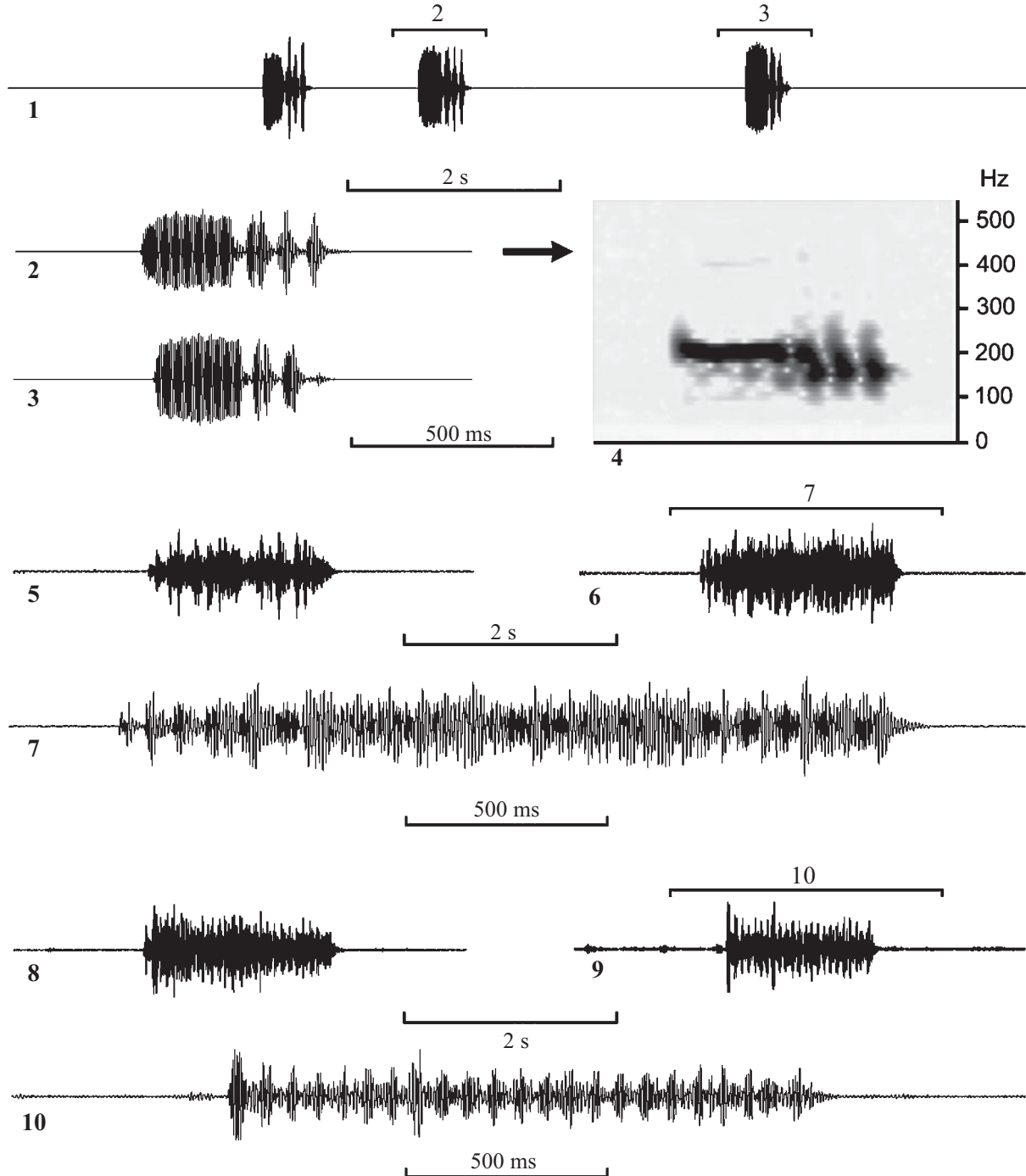
consist of a series and several pulses.

Subfamily Metrodorinae

Bolivaritettix chinensis (Hancock, 1912)

MATERIAL: ♂ (Kattien). Temperature during recording +29...+31°.

The signals of the single male (Figs 5–7; Table) represented by single series. After emission such series male fell silent for a long time.



Figs 1–10. Vibrational signals of pygmy grasshoppers males: 1–4 — *Paratettix hirsutus*; 5–7 — *Bolivaritettix chinensis*; 8–10 — *Criotettix bispinosus*; 1–3, 5–10 — oscillogramms; 4 — sonogram.

Рис. 1–10. Вибрационные сигналы самцов тетригид: 1–4 — *Paratettix hirsutus*; 5–7 — *Bolivaritettix chinensis*; 8–10 — *Criotettix bispinosus*; 1–3, 5–10 — осциллограммы; 4 — сонограмма.

Subfamily Scelimeninae

Criotettix bispinosus (Dalman, 1818)

MATERIAL: ♂ (Kattien). Temperature during recording +22...+26°.

The signals of the single male (Figs 8–10; Table) are close to those of the previous species, and also represented as single series. After reproduction of such series male fell silent for a long time too.

Discussion

Analysis of vibration signals of Tetrigoidea representatives of subfamilies Metrodorinae (*B. hinensis*) and Scelimeninae (*C. bispinosus*) from South-East Asia shows that they are close to those of the Palaearctic species of the subfamily Tetriginae (*Tetrix* spp.) [Benediktov, 2005]. But unexpectedly signals of the representative of the nominotypical subfamily Tetriginae (*P. hirsutus*) are complicated with simultaneously frequency — and amplitude-modulated vibration signals. This finding shows that the organization of vibrational communication in tropical pygmy grasshoppers can be arranged much

more complex and diverse than we assumed while signals of species from the territory of Russia, and Eastern and Western Europe.

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References

- Benediktov A.A. 1998. Acoustic communication of tetrigids of genus *Tetrix* (Orthoptera, Tetrigidae) // Entomol. Rev. Vol.78. P.892–895.
- Benediktov A.A. 2005. Vibratory signals in the family Tetrigidae (Orthoptera) // Proc. Rus. Ent. Soc. Vol.76. P.131–140 [in Russian].
- Kočárek P. 2010. Substrate-borne vibrations as a component of intraspecific communication in the groundhopper *Tetrix ceperoi* // Journal of Insect Behavior. Vol.23. No.5. P.348–363.
- Kočárek P., Holuša J., Grucmanová S. & Musiolek D. 2011. Biology of *Tetrix bolivari* (Orthoptera: Tetrigidae) // Cent. Eur. J. Biol. Vol.6. No.4. P.531–544.
- Pushkar T.I. 2009. *Tetrix tuerki* (Orthoptera, Tetrigidae): distribution in Ukraine, ecological characteristic and features of biology // Vestnik zoologii. Vol.43. No.1. P.15–28.