

New records of the reed cricket *Natula averni* (Costa, 1855) (Orthoptera Gryllidae) in Sicily

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ABSTRACT Three new distribution records of the reed cricket *Natula averni* (Costa, 1855) (Orthoptera Gryllidae) are reported for Sicily based on sound recordings. Additional information is provided for the song of this rare cricket species.

KEY WORDS Bioacoustics; biogeography; *Natula averni*; Orthoptera; Sicily.

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INTRODUCTION

Knowledge about the distribution and ecology of the reed cricket *Natula averni* (Costa, 1855) (Orthoptera Gryllidae) is rather poor. Italian records for the species are rare. After the description of the species in 1855 from near Naples (Costa, 1855) the species was detected in Sardinia in 1987 (Schmidt & Herrmann, 2000) and in Sicily in 2006 (Odé et al., 2011). Some records are also known from the provinces of Apulia, Basilicata, Calabria and Tuscany (Island of Elba).

The situation on Sicily can be explained as follows. The first find on the basis of sound recordings was at the Foce del Belice by Odé et al. (2011). A second locality has been photographically secured by Luigi Barraco near Trapani and published by Surdo (2019). Odé et al. (2011) put forward a call for extra information and as our summer holiday in 2020 was held on Sicily, I was willing to respond to the call and take up the challenge.

MATERIAL AND METHODS

The well-known locality at the Foce del Belice

(mouth of the river Belice) was visited to build a good reference to the sound. The animals were heard singing in the evening of August 2 and the morning of August 3, 2020. A couple of localities with circumstances that seemed to fulfill the species' needs, mainly the mouths of perennial current streams, were planned to visit. They concerned the mouths of the rivers (foce del fiume) Modione, San Leonardo, Tellaro and Simeto.

Recording equipment consisted of a mono microphone (Clippy EM172) and an Edirol R-09 digital recorder. The microphone broke down after the first location and was later replaced by a brandless stereo microphone. Eventually the use of mobile phones (Samsung Galaxy A5 with the Hi-Q mp3 recorder app and I-phone 7, both with internal microphones) was added to record songs.

For analysis and graphic production, the software program Elekon Batexplorer Version 2.1.7.0 and the free sound editing software of Ocenaudio have been used to generate oscillograms and spectrograms. As the song of this cricket appeared to be within a narrow band of frequencies around 6-8 kHz, a high pass filter with a cut-off frequency of just below the echeme frequency has been used to clean the recordings from disturbing noises (wind, breakers, birds

and people). With a low pass filter sometimes the song of a second male at a slightly higher frequency could be cleaned off too. Some characteristics of the song were compared with the literature.

RESULTS

Attempts to reach the river San Leonardo (from the north) within hearing distance failed, due to gated ways. At the other three river mouths the presence of reed crickets was detected immediately at arrival. Silent moments without singing males were not registered. The three new records are presented on the map in figure 1 together with the two previously identified localities.

Exact locations, dates, availability of recordings and used equipment are presented in Table 2.

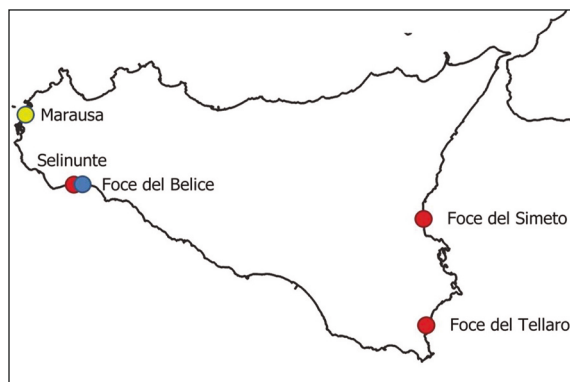


Figure 1. Map of the distribution of *Natula averni*. Light blue: Foce del Belice; yellow: Marausa; red: new records.

Only bioacoustic evidence was collected. Sightings of specimens did not work out, despite occasional occurrence of singing males within very short distance.

Due to a technical failure of the microphone no sound recordings are available from Foce del Modione. Some sound characteristics of males singing at the Belice, Tellaro and Simeto river mouths are given in Table 1 and compared to the Sicilian track from Odé et al. (2011). In figures 2 and 3 some of the species-specific sound characteristics are shown graphically (oscillogram and spectrogram).

The Modione population, within the archaeological site of Selinunte, is separated from the Belice population by almost 4 km of unsuitable habitats. The Tellaro and Simeto river mouths are located 215 and 197 km from Belice respectively.

Though different between recordings, within each recorded song the number of syllables per echeme was remarkably constant (see ranges and very low standard deviations). The recorded sound characteristics were found to be largely consistent with the data given by Odé et al. (2011). Some deviations were noticed and are treated in the discussion.

DISCUSSION

With relatively little effort, three new distributional records could be added to the only two populations known up until now. Two of the new records are from Syracuse and Catania provinces at the east side of the island far outside the distri-

	temp. (°C)	evaluated number of echemes	mean echeme duration (ms, min-max)	echeme tempo (/s)	syllable tempo (/s)	mean number of syllables per echeme \pm SD (min-max)	peak frequency (kHz)
Belice*	25	?	240 (230–250)	2.2	87	20.9 (20–21.8)	6.4
Belice	32	23	223 (197–232)	2.4	96	21.4 \pm 1.1 (19–23)	7.1
Tellaro	24	20	326 (310–347)	2.1	80	26.1 \pm 1.2 (24–29)	6.7
Simeto 1	26	11	245 (234–296)	3.0	125	30.6 \pm 2.6 (26–35)	7.5
Simeto 2	26	8	273 (263–283)	2.7	64	23.9 \pm 1.4 (22–27)	6.8

Table 1. Details of sound recordings. *: Take 33 as recorded by B. Odé (Odé et al., 2011).

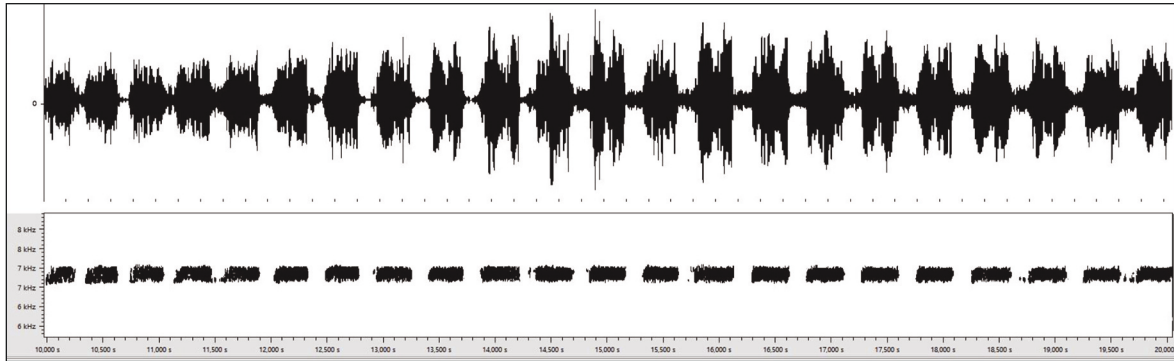


Figure 2. Oscillogram and spectrogram of 10 sec. of a song at Foce del Tellaro on August 7, 2020.

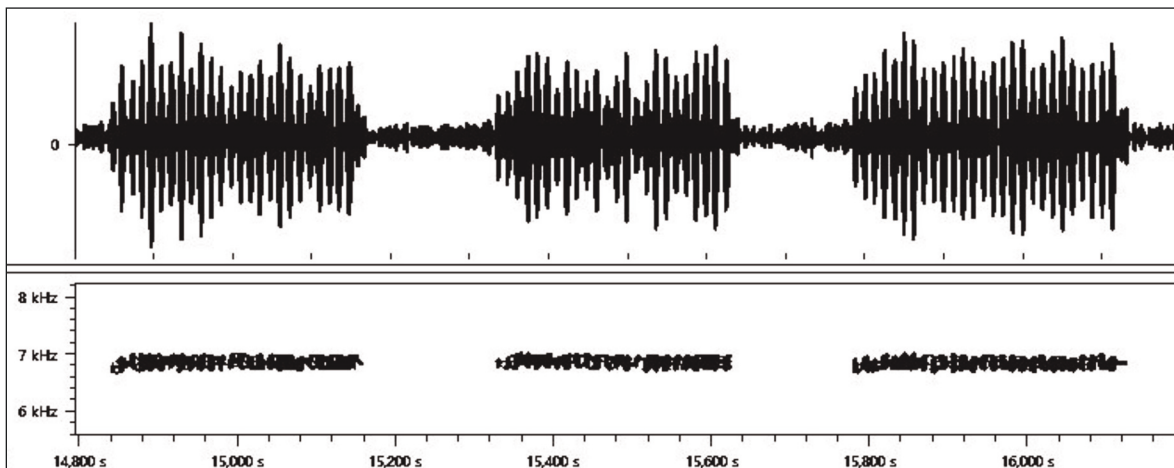


Figure 3. Oscillogram and spectrogram of 2 sec. of a song at Foce del Tellaro on 7 August 2020.

River	Municipality/Province	Coordinates	Date	Recording method
Belice	Castelvetrano/Trapani	37.583118N 12.866478E	2.VIII.2020	24 bit wav, 44.1 kHz, mono microphone
Modione	Castelvetrano/Trapani	37.582430N 12.822300E	3.VIII.2020	not available
Tellaro	Noto/Syracuse	36.837880N 15.105492E	7.VIII.2020	24 bit wav, 44 kHz wav, Hi-Q mp3 rec app, mobile phone Samsung Galaxy A5 & I-phone 7, internal microphone
Simeto	Catania/Catania	37.400670N 15.088050E	8.VIII.2020	24 bit wav, 44.1 kHz stereo microphone

Table 2. Data on locations and recordings.

tribution known, which makes it probable that the species has a large distribution, maybe all around the island. It is suspected that the distribution is highly underreported and several other populations must exist. The San Leonardo river, that could not

be reached, Lago Gornalunga close to the Simeto river and several other river mouths like those of the rivers Platani, Salso, Anapo, Cassabile, Asinaro, Irminio are all good candidates and are in need of exploration.

Although no sightings or voucher specimens could be obtained, the unequivocal identification was possible by audible perception of the very specific sound and digital recordings thereof.

As the population density was high, multiple males were always singing simultaneously and getting clear sound recordings in situ proved difficult. Most recordings show (traces of) other singing males, which can be seen as vague echemes on slightly different frequencies (from a second male nearby) in the spectrograms, noise at the specific peak frequency or noise between echemes and in the low dB-range (from other males further away). The Simeto1 recording showed a remarkable high syllable tempo (125 instead of 80–100) together with a high number of syllables per echeme with a mean of 30 instead of 17–21.

Equally loud syllables within echemes, as described by Odé et al. (2011), was not the rule in this study. The same authors also wrote that sometimes the first 1–3 syllables are weaker than the following ones. In this study this was found in some cases, but in addition it was noticed that the narrow frequency band also raised with approximately 0.1 kHz during this start before getting a quasi constant frequency (Fig. 3).

According to Odé et al. (2011) the song could be heard in the afternoon, evening and night. In this study songs were also heard and recorded in the mornings at all four localities up to four hours after sunrise and later observations only lack due to leaving the area. The song probably can be heard throughout the day, which facilitates research.

Except for the non-important harmonics, the song of the reed cricket does not contain ultrasonic components, which means that relative simple recording equipment can be used to provide proof of presence.

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