

**Short scientific note**Submitted: August 19<sup>th</sup>, 2020 - Accepted: October 10<sup>th</sup>, 2020 - Published: November 15<sup>th</sup>, 2020**First description of calling song of *Arcyptera alzonai* and possible taxonomic implications (Insecta: Orthoptera, Acrididae, Gomphocerinae)**

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luca.anselmo@hotmail.it**Abstract**

The aim of this study was to contribute to the knowledge of *Arcyptera alzonai*, considered an endemic Italian species, whose biology is little known and which has an uncertain taxonomic status. Some individuals were found on a small site within its historical presence area in Susa Valley (Piedmont, NW Italy). Some recordings of the song, until today unknown, were made and analyzed. From the oscillograms obtained, no significant differences emerged with the congener species *Arcyptera microptera*. Also according to various authors these two species are at the moment indistinguishable from a morphological point of view. Therefore, a possible synonymy among these two taxa can be assumed which, however, must be investigated and confirmed by further research based on genetic analysis.

**Key words:** *Arcyptera alzonai*, *Arcyptera microptera*, bioacoustic analysis, oscillograms, calling song, seewave.

**Introduction**

*Arcyptera alzonai* Capra 1938 is so far considered an Italian endemic species (Massa & Fontana 2020), extremely localized with a fragmented range in the northwest of the country, present only in the Piedmont and Aosta Valley regions (Massa et al. 2012; Iorio et al. 2019).

*A. alzonai* was described by Felice Capra on the basis of some specimens collected in the Susa Valley, near Bardonecchia (Piedmont, NW Italy) by Carlo Alzona (Capra 1938). Is a medium-sized, colourful grasshopper, whose wings almost reach the hind knees in the male (shorter in the female), and whose lateral pronotal carinae are bent in the prozona (Harz 1975; Massa et al. 2012; Iorio et al. 2019). Its biology is poorly understood. It is generally considered a thermophilic species, with summer phenology (Massa et al. 2012). The sites of presence are between 720 and 1850 m of elevation (Sindaco et al. 2012). Its ecology is assumed to be similar to *Arcyptera microptera* (Fischer von Waldheim, 1833) (Massa et al. 2012).

The taxonomic status of *A. alzonai* is considered uncertain, in particular the morphological differences with *A. microptera* are unclear (Massa et al. 2012; Sardet et al. 2015; Iorio et al. 2019). The aim of the present research was therefore to contribute to the knowledge of this rare taxon, attempting to describe its unknown song (Massa et al. 2012; Iorio et al. 2019). As is well known, the songs emitted by Orthoptera have a specific significance, frequently contributing to clarify their taxonomy; additionally, these songs are increasingly seen as fundamental tools

in field research (Riede 2018). *A. alzonai* is endangered (EN) according to the threat categories in the European Red List of Grasshoppers, Crickets and Bush-crickets, given the small area of occupancy (less than 500 km<sup>2</sup>), the fragmentation of the population, the continuous decline inferred in the number of mature individuals and in the quality of its habitat (Hochkirch et al. 2016).

**Materials and Methods**

The species has been searched in the area of historical presence, in the territory of the municipality of Bardonecchia (Piedmont, NW Italy), within which the most recent attendance data available dates back to 1946 (Fontana et al. 2005). The song was recorded in the field with RODE VideoMic (frequency range of 40Hz-20kHz) and analyzed with RStudio (ver. 1.1.463) using package 'seewave' (Sueur et al. 2008). The song terminology in the description follows Rague & Reynolds (1998). The sound records of related taxa provided by Massa et al. (2012), Sardet et al. (2015) and Bellmann & Luquet (2009) were used for comparison.

**Results**

Five male and one female specimens were found on 5 August 2020 in a small site at 1495 m of elevation (Figs 1–2). It consists in a xeric meadow facing southeast, having a

fair amount of rocks and bare soil and surrounded by a sparse tree cover. Songs belonging to 3 different males were recorded and analyzed.

*Song description*

The typical calling song (Fig. 3 a) is composed by two part, separated by a gap of 1,3–2,5 s. The first part include 3 short echemes, each consisting of 2–4 syllables (Fig. 3

b). The second part of the song consist in a series of 2–16 ticking syllables repeated approximately every 0,1 s, followed by a long echeme consisting in 8–10 syllables (Fig. 3 c). The last tick that precedes the long echeme has a longer duration than the others. In some cases the second part of the song is repeated 1–2 times. The emission frequency is between 3 and 18 kHz (Fig. 4). The audibility of the sound is up to 6 m under ideal conditions.



**Fig. 1** – Biotope of *Arcyptera alzonai* near Bardonecchia (UTM WGS84 32N LQ29).



**Fig. 2** – One of the recorded male specimens of *Arcyptera alzonai*.

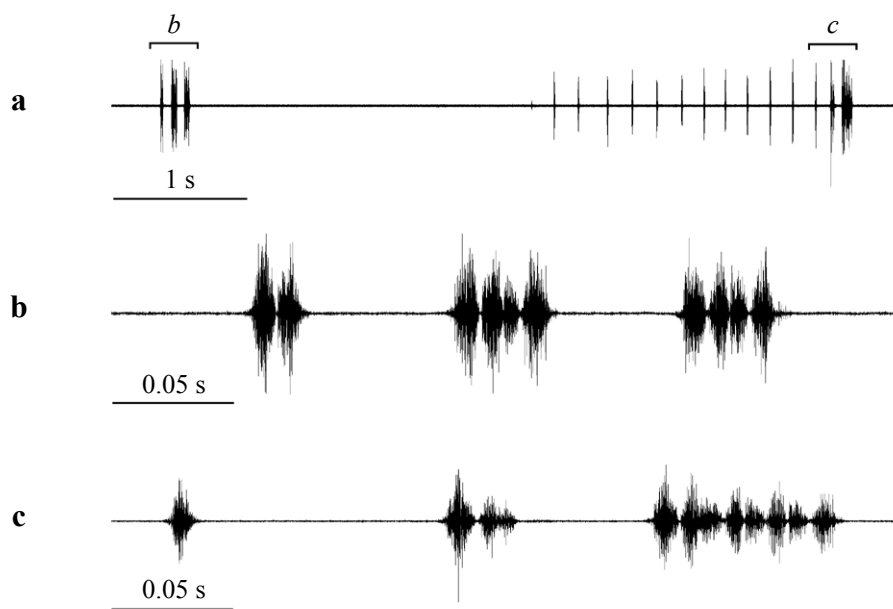
## Discussion

The calling song of *Arcyptera alzonai* proved to be very similar to that of some other species belonging to the subgenus *Pararcyptera*. In particular, the structure of the song coincides very well with description and the oscillograms provided by Ragge & Reynolds (1998) for *Arcyptera microptera*. The comparison of the number of echemes and syllables is shown in Tab.1. Also observing the related descriptions and records of the subspecies *microptera* provided from subjects belonging to Italian populations by Massa et al. (2012) and by Sardet et al. (2015), and by Bellmann & Luquet (2009) for the subspecies *carpentieri* present in France, the only appreciable differences consist in the num-

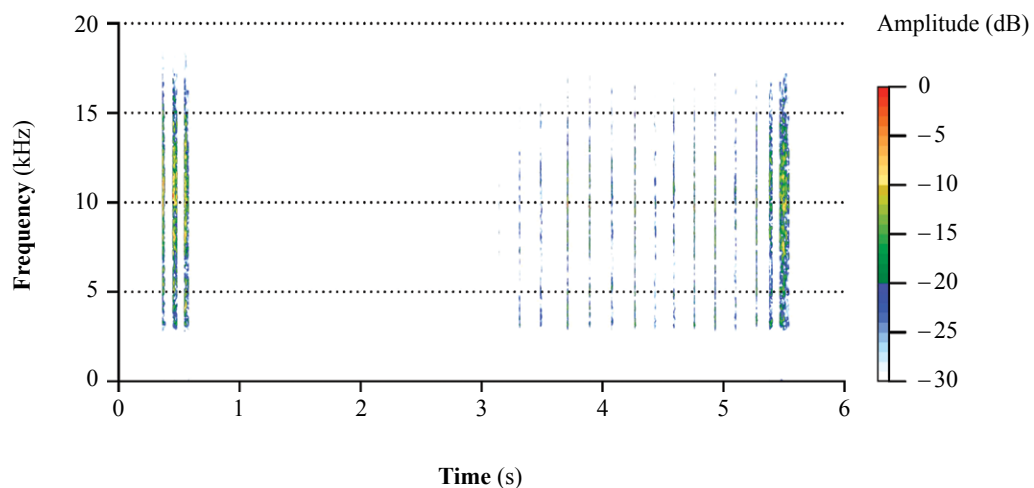
ber of syllables that compose the echemes in the first part of the song (more numerous in these subspecies than in what was found for *A. alzonai*). The existence of the first part of the song in the subspecies *microptera* is not reported by Şirin et al. (2017) for specimens from Turkey, by Savitsky (2002) from Russia and nor from García et al. (1996) for specimens from the Iberian Peninsula, while the second part of their songs looks very similar to what is found for *A. alzonai*.

## Conclusions

In light of this study, there are no significant differences in calling song structure between *Arcyptera alzonai* and *Arcyptera microptera*. If we also consider the uncertain morphological differences between the two taxa (Massa



**Fig. 3** – Oscillograms of the calling song of *Arcyptera alzonai* emitted at 11:30 AM with 26° C and sunny weather, at two different speeds.



**Fig. 4** – Spectrogram of the calling song of *Arcyptera alzonai*.

**Table 1** – Comparison between the characteristics of the calling song of *Arcyptera microptera* provided by Ragge & Reynolds (1998) and the song of *Arcyptera alzonai* collected in this study.

Song parameter	<i>A. microptera</i>	<i>A. alzonai</i>
n. of short echemes	1–3	3
n. of syllables in short echemes	3–5	2–4
duration of gap between the two part	1–3 s	1,3–2.5 s
n. of ticking syllables preceding the long echeme	<5–>20	2–17
n. of syllables in long echeme	8–12	8–10

et al. 2012; Sardet et al. 2015; Iorio et al. 2019), it can be assumed that this is a case of synonymy which, however, must be investigated and confirmed by further research based, e.g., on genetic analysis.

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