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***Lluciapomaresius nisae*, a new species of Ehippigerini (Orthoptera: Tettigoniidae: Bradyporinae) from the northeast of the Iberian Peninsula**

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Abstract

A new species of the genus *Lluciapomaresius* Barat, 2012 is described from Serra de Llaberia in Catalonia (in the northeast of Iberian Peninsula). *Lluciapomaresius nisae* n. sp. was collected in a Mediterranean pine forest dominated by European black pine (*Pinus nigra*) and secondarily by Calicolous rosemary scrub. *L. nisae* is compared to *L. panteli* (Navàs, 1899) from which it can be separated mainly by the shape of the male cerci, the titillators and the male calling song. Also in the females by the protuberances at the base of the ventral valves of the ovipositor.

Key words: Prelitoral Catalan Mountains, Mediterranean pine forest, isolation, Serra de Llaberia, Catalonia

Introduction

The Bradyporinae have always offered considerable taxonomic problems. The description of a new species can help solve some of the unknowns of these questions. In a revision of the genera of *Ehippigerini* (Barat, 2012), the author creates 6 new genera: *Afrosteropleurus*, *Coracinotus*, *Corsteropleurus*, *Lluciapomaresius*, *Parsteropleurus* and *Soparagus*, segregated from *Steropleurus*. According to this work there are 7 species belonging to the genus *Lluciapomaresius* Barat, 2012, two of which have been described from Catalonia, *L. ortegai* (Pantel, 1896) and *L. panteli* (Navàs, 1899). A new species of this genus was found among new *Lluciapomaresius* specimens observed by Jarkov Reverté in a Mediterranean pine forest of the Serra de Llaberia, a protected area located in the Prelitoral Catalan Mountains (All material recollected as detailed in Results section). At south of this area there are the Serra del Port with the presence of *L. ortegai* (Pantel, 1896) and to the north the Serra del Montsant at 40 km in straight line to the Serra de Llaberia, with the presence of *L. panteli* (Navas, 1899) named in Catalan Somereta del Montsant (Olmo-Vidal 2006) (see map fig.1).

Methods

The type materials of new species are preserved in the Museu de Ciències Naturals de Barcelona (MCNB). The coordinate system employed for designation of localities is the UTM (Universal Transverse Mercator), subdivided into 10 x 10 km grid squares. Catalonia corresponds to zone 31T. Mounted specimens were measured with a digital calliper (precision 0.01 mm). The following measures were taken in mm. Body length (TL=dorsal length from the fastigium of the vertex to the apex of the abdomen); Pronotum length (PL=length of the pronotum along dorsal median line); Pronotum height (PH=maximum height of the pronotum); Hind femur length (HFL= maximum length of hind femur); Tegmina length (TGL=maximum length of exposed tegmina) and Ovipositor length (OL= maximum length from de base to the apex of ovipositor).

For song recordings we used a digital recorder OLYMPUS LS10 and for Oscillographic analysis used Sound Forge 6.0 software. The specimens were kept outdoors (approx. 23 °C). The distance between subject and microphone was about 15 cm.

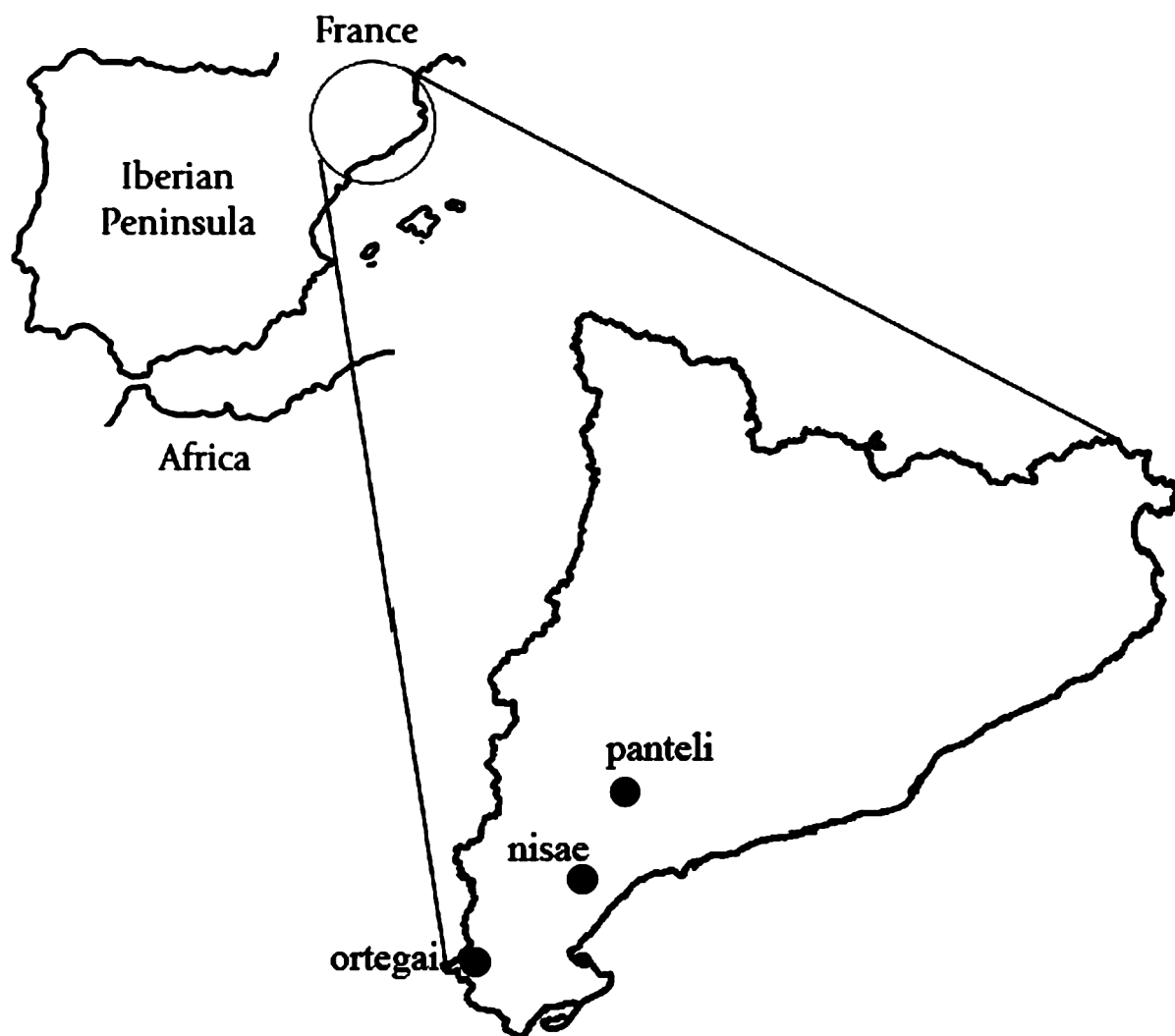


FIGURE 1. Map of the location of *L. nisae* with reference to the other species of the genera in Catalonia: *L. ortegai* and *L. panteli*.

To include *L. nisae* **n. sp.** in the genera *Lluciapomaresius* have compared with the *L. panteli*. We take into account especially the morphology and the calling song.

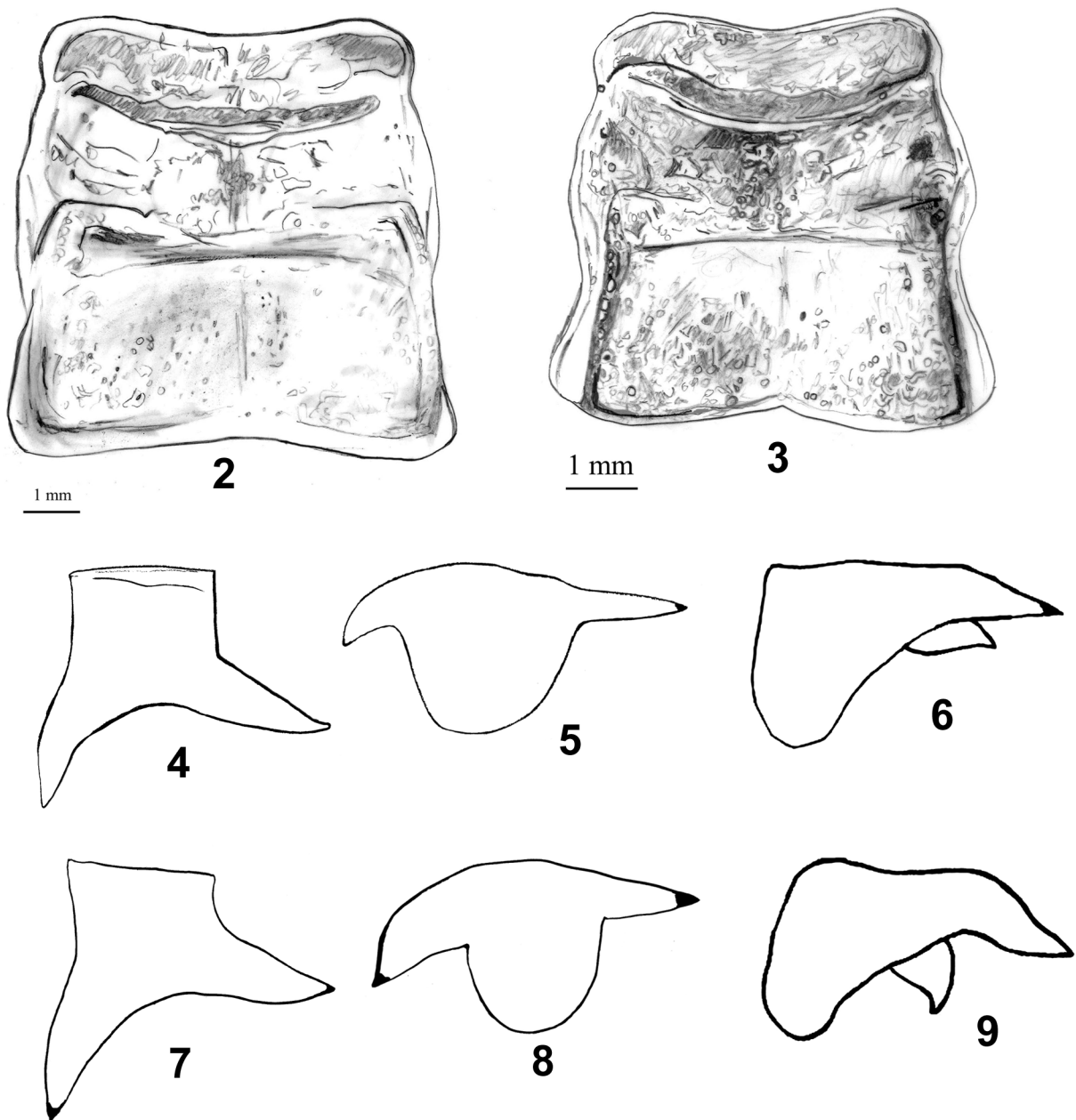
Results

Lluciapomaresius nisae Olmo-Vidal, new species

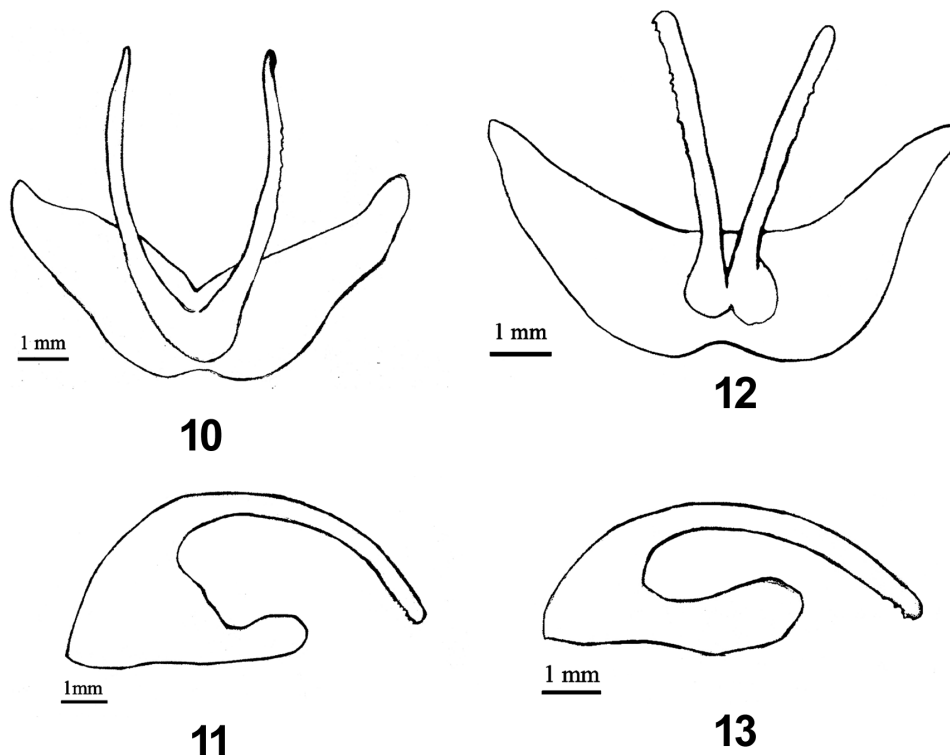
Material examined. Catalonia, Mola del Perelló, Tivissa (610 m), UTM: 31TCF14, 14.X.2015, J. M. Olmo-Vidal leg. (1♂ **holotype**) (MCNB). Catalonia, Mola del Perelló, Tivissa (610 m), UTM: 31TCF14, 14.X.2015, J. M. Olmo-Vidal leg. (1♂ paratype) (MCNB). Catalonia, Mola del Perelló, Tivissa (630 m), UTM: 31TCF14, 27.X.2014, J. M. Olmo-Vidal leg. (2♀ paratypes) (MCNB). Catalonia, Mola del Perelló, Tivissa (610 m), UTM: 31TCF14, 13.X.2016, J.M. Olmo-Vidal leg. (1♀ paratype).

Description. Male (Holotype). General coloration with the head, metazona and abdomen dark. Prozona, Tegmen, Legs and lateral part of tergites cream coloured. Fastigium verticis narrow, short-triangular, tip pointed, dorsally weakly grooved. The pronotum in dorsal view is square shaped just as long as wide (Fig 2). Pronotum saddle-shaped, strongly wrinkled, front border upraised and concavely rounded, prozona as long as metazona.

Lateral carinae parallel to behind reaching hind margin of pronotum. Auditive spiracle narrow approximately four times high than wide. Tegmen reaching the margin of the first terguita of abdomen. Cells of tegmen disc small. Tenth (10th) tergite in middle half-circlike excised. Subgenital plate large, at base triangularly excised, hind margin incised as long as stylus which are rounded and truncate. The cerci are approximately equal width than long, cylindrical and robust basally. Internal margin straight. Inner tooth and terminal tooth of equal length. In dorsal view, internal tooth triangular (Fig 4). The insertion of the internal tooth is angled to the cerci, long and divergent in angle obtuse in relation to the base. In the rear view internal tooth is long, three times longer than the width of the base (Fig 5). In lateral view the apical tooth is straight and the internal tooth inserted in an angle of 30 degrees (Fig 6). Epiproct triangularly rounded to half-circled. Titillators in dorsal view with apical branch close slightly curved to narrow the distal apex much longer than the baseline. Parts basal fused in between and broad narrowed towards the apex (Fig 10). In lateral view, the basal branch very broad and high basally with the apical branch very bent towards down, toothed on the apical part (Fig 11). Subgenital plate with the hind margin incised v-shaped emarginate.



FIGURES 2–9. Dorsal view of Pronotum of males. Holotype of *L. nisae* (2) and male of *L. panteli* from Albarca, Montsant (3). Cerci of males in dorsal, in rear and in lateral view of holotype of *L. nisae* (4, 5, 6) and *L. panteli* from Albarca, Montsant (7, 8, 9).



FIGURES 10–13. Titillators in dorsal and lateral view. Holotype of *L. nisae* (10,11), *L. panteli* from Albarca, Montsant (12,13).

Female. Cerci short, broad-conical. Seventh (7th) sclerite elongated with the posterior margin emarginated (Fig 14). Subgenital plate almost square, posterior margin in repose also emarginated, laterally with the broad brown bands on both sides of the plate more strongly sclerotized (Fig 14). Ovipositor in proximal half straight, apically slightly upcurved and weakly rasped (Fig 16) with the base of the ventral valves transversally sulcated (Fig 17).

Sonogram of male. Oscillogram of male calling song of *L. nisae* sp. n. with the long echeme consisting of 5 syllables, recorded on 10.10.2015, 20 oC. The last closing hemisyllable (aprox. 390 ms) is about three times as long as the previous opening hemisyllable (aprox. 70 ms) without interval. The last hemisyllable is less intensive than the previous one (Fig 20).

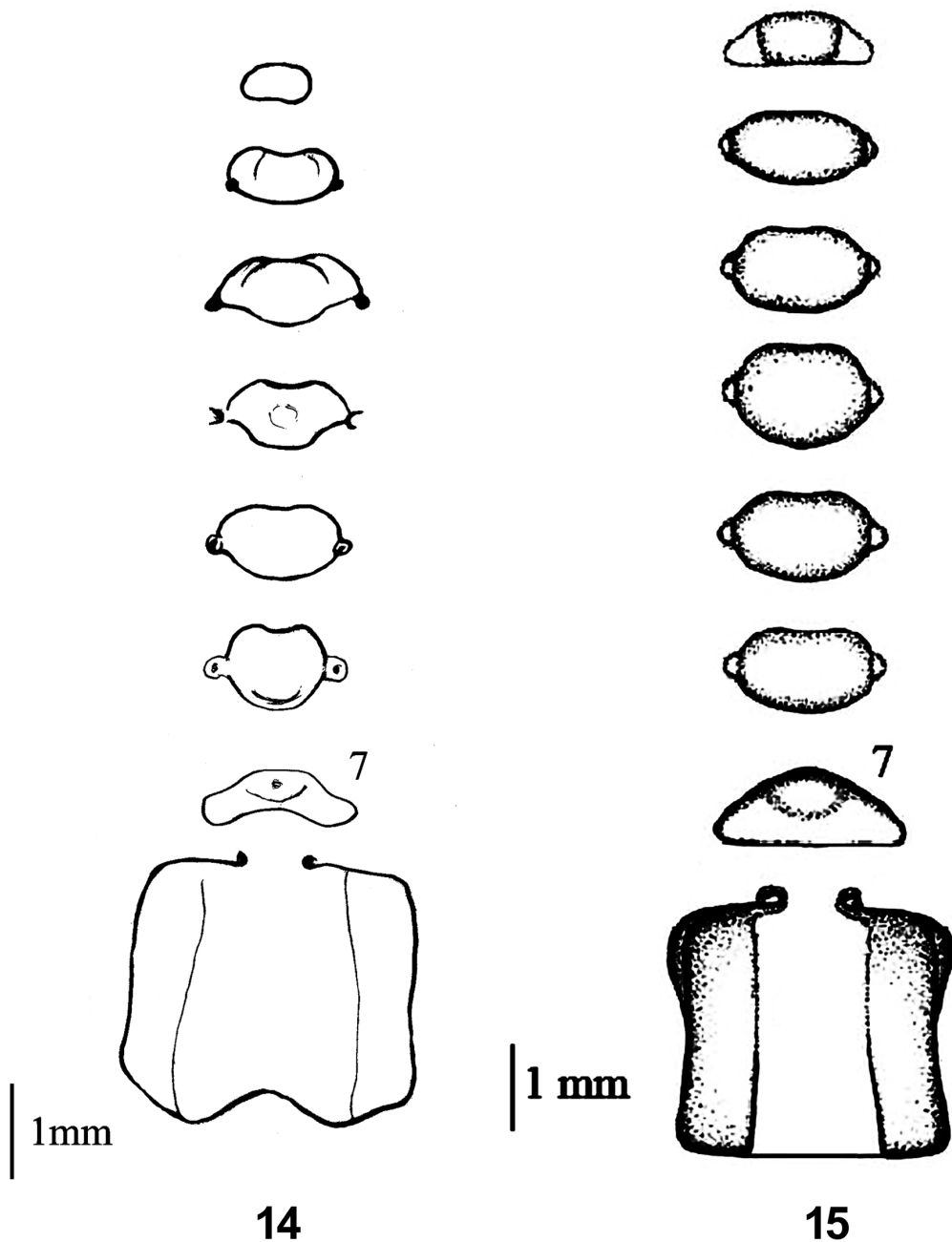
Etymology. This species is named after the dog “Nisa” dead in 2015, present in the prospection of *L. nisae*.

Measurements. See Table 1.

TABLE 1. Biometrics (mean in mm \pm s. d.) of *Lluciapomaresius nisae* n. sp. and *L. panteli* TL = Total length; PL = Length of pronotum; PH = Height of pronotum; HFL = Length of hind femora; OL = Length of ovipositor. The holotype is included in males mean measurements.

	TL	PL	PH	HFL	OL
holotype	27.59	7.43	7.32	17.39	
<i>L. nisae</i> ♂ (n=2)	26.96 \pm 0.8	7.49 \pm 0.1	7.14 \pm 0.2	17.51 \pm 0.1	
<i>L. nisae</i> ♀ (n=3)	30.56 \pm 2.7	7.96 \pm 0.3	7.16 \pm 0.2	17.42 \pm 1.2	14.67 \pm 0.1
<i>L. panteli</i> ♂ (n=4)	25.60 \pm 3.7	7.74 \pm 0.6	7.27 \pm 0.5	16.35 \pm 0.2	
<i>L. panteli</i> ♀ (n=3)	25.9 \pm 2.8	7.96 \pm 0.2	7.10 \pm 0.7	16.18 \pm 0.8	13.17 \pm 0.7

Additional material examined of *L. panteli* (all in MCNB col. J. M. Olmo-Vidal). Catalonia, La Morera de Montsant (1043 m), UTM:31TCF27 20.IX.2008, J. Barat leg. (1♀,1♂). Catalonia, Albarca (790 m), UTM: 31TCF27, 15.X.2014, D. Martínez leg. (1♂, 2♀). Catalonia, Ulldemolins (675 m), UTM: 31TCF27, 15.X.2015, E. Piera leg. (1♂). Catalonia, La Morera de Montsant (1043 m), UTM:31TCF27 10.X.2014, J.M. Olmo-Vidal leg. (1♂).

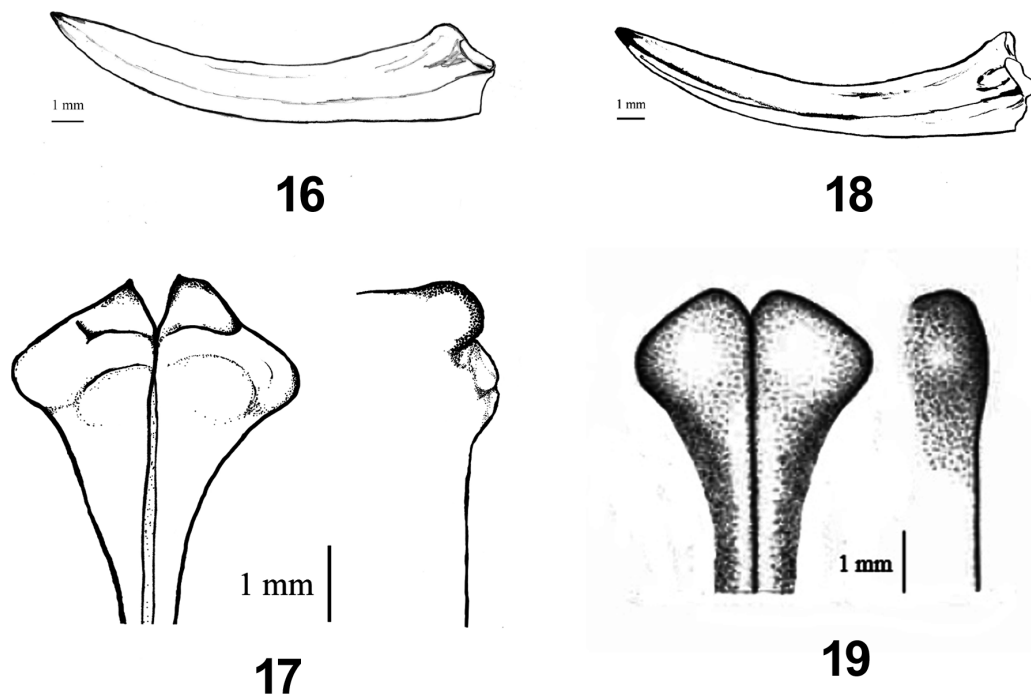


FIGURES 14–15. Ventral sclerites and subgenital plates of paratype of *L. nisiae* (14) and *L. panteli* (15, redrawn according to Barat 2012).

Discussion

Many species of Bradyporinae have closely morphological characters, for example in the genera *Coracinotus* and *Lluciapomaresius*. In reference to this, the females of *L. eclipticus* and *L. ortegai* are almost impossible to distinguish (Barat, 2004).

In the case of *L. nisiae* can be readily distinguished from *L. panteli* by the male genitalia, the male calling song, the ventral sclerites of the female and the ventral valves of the ovipositor. The measurements are very similar in *L. nisiae* and *L. panteli* but *L. nisiae* have the total length of the body and the length of hind femora longer than *L. panteli*. Although the total length of the body is very variable in function of the specimen's conservation this is a morphological helpful measure.



FIGURES 16–19. Ovipositors in lateral view and the base of the ventral valves of paratype of *L. nisae* (16, 17), *L. panteli* from Albarca, Montsant (18) and *L. panteli* (redrawn according to Barat 2012).

In the males, the pronotum in dorsal view in *L. nisae* is square-shaped but in *L. panteli* is like trapezoidal shape. The lateral carinae are more robust, tuberculate and divergent in *L. panteli* than in *L. nisae* (Figs 2, 3). To reference of the male cerci, the insertion of the internal tooth is angled to the cerci in *L. nisae* (Fig 4) but in *L. panteli* this insertion is not angled (Fig 7). In the rear view internal tooth is long, three times longer than the width of the base in *L. nisae* (Fig 5) but in *L. panteli* the internal tooth is only two times longer than the width (Fig 8). In lateral view the terminal tooth is straight and the internal tooth inserted in an angle of 30 degrees in *L. nisae* (Fig 6). In *L. panteli* the terminal tooth is curved down and the internal tooth inserted almost in angle straight (Fig 9). In *L. nisae* the titillators in dorsal view with apical branch close slightly curved to narrow the distal apex, much longer than the baseline but in *L. panteli* are almost equal (Fig 10, 12).

To reference of the calling song, the expressed acoustic differences are not always accompanied by reproductive isolation but these differences in Orthoptera can be much more significant factors of speciation than the morphological characters (Kenyeres *et al.* 2009). Anyway, in this case, there are also sufficient morphological differences to indicate that *L. nisae* and *L. panteli* have a reproductive isolation and are two different taxon.

The male calling songs of the *L. nisae* and *L. panteli* are different. In the schemes of the males of *L. panteli* (Fig 21) (also in *L. ortegai*) the pulse-frequency of the close hemisyllabe was usually highest at the beginning (Pfau & Pfau 2015). In contrast the close hemisyllabe of *L. nisae* was lower than the beginning (Fig 20). Also, the last closing hemisyllable is about three times as long as the previous opening hemisyllable in *L. nisae* but shorter in *L. panteli*.

With reference to females, the ovipositors and subgenital plates of *L. nisae* and *L. panteli* are very similar in shape and size. The ovipositors in *L. nisae* is more straight in the proximal half, robust and long (Fig 16) than in *L. panteli* (Fig 18). Although the shape of the subgenital plate is variable of both species, in *L. nisae* the posterior margin of the subgenital plate is a little more emarginated in repose than in *L. panteli* (Figs 14, 15). The subgenital plates of the females of both species are almost square with a softly sclerotized compressible area with the brown bands on both sides more strongly sclerotized, that enable the females to move the ovipositor downwards during ovipositing, absent in the other species of the genera (Pfau & Pfau 2015). Additionally the copulatory groove in *L. nisae* is proportionally more separated in relation to the wide of the subgenital plate than in *L. panteli* (Figs 14, 15).

The importance of the dilatations and protuberances at the base of the ventral valves of the ovipositor as well as ventral sclerites of the females are a potential taxonomic character for separated females of Bradyporinae (Nadig 1994, Barat 2007).

The shape of the base of the ventral valves and the ventral sclerites are very different in *L. nisiae* and *L. panteli*. In the *L. nisiae* the base of the ventral valves is transversally sulcated (Fig 17) and in *L. panteli* is smooth and not sulcated (Fig 19). Also the Seventh (7th) sclerite in *L. nisiae* (Fig 14) is more elongated and emarginated in the posterior margin than in *L. panteli* in which is trapezoidal (Fig 15).

In reference to the habitat, *L. nisiae* was found in a forest area (Fig 22) dominated by European black pine and *L. panteli* in general live frequently in an opened area dominated by Mediterranean bush but some specimens live on the three. Until now, the range of altitude of *L. nisiae* is between 610 to 630 m and the range of altitude of *L. panteli* is between 640 to 1.160 m.

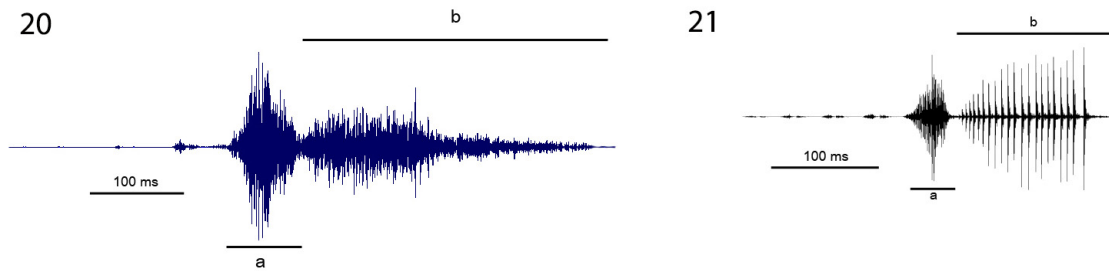


FIGURE 20–21. Male song of holotype of *L. nisiae* (20) and *L. panteli* (21, redrawn according to Pfau & Pfau 2015): a, opening-hemisyllable (sound produced by the opening movement of the tegmina); b, closing-hemisyllable (sound produced by the closing movement of the tegmina) (see also Pfau & Pfau, 2015).



FIGURE 22. Holotype (male) of *L. nisiae*.

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