Six Orthoptera species new to the fauna of Portugal
(Orthoptera: Tettigoniidae, Gryllidae, Tetrigidae, Acrididae)
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Abstract: Six species of Orthoptera are reported as new to the Portuguese fauna: Cyrtaspis tuberculata Barranco, 2005, Natula averni (Costa, 1855), Oecanthus dulcisiconans Gorochov, 1993, Pteronomobius heydenii (Fischer, 1853), Tetrix bipunctata kraussi Sauley, 1888 and Stenobothrus grammicus Cazuro, 1888. The first documented records of Stenobothrus bolivarii (Brummer von Wattenwyl, 1876) and Omocestus viridulus kaestneri Harz, 1972 are presented, along with new records of some rare species: Leptophyes punctatissima (Bosc, 1792), Conocephalus conocephalus (Linnaeus, 1767), Metrioptera ambigua Pfau, 1986 and Sphingonotus nodulosus Lluciá-Pomares, 2013.

Key words: Orthoptera, Tettigoniidae, Gryllidae, Tetrigidae, Acrididae, Tetrix bipunctata kraussi, new records, bioacoustics, chorology, Portugal.

Seis especies de Orthoptera nuevas para la fauna de Portugal (Orthoptera: Tettigoniidae, Gryllidae, Tetrigidae, Acrididae)
Resumen: Se registran seis especies de ortópteros nuevas para la fauna portuguesa: Cyrtaspis tuberculata, Natula averni, Oecanthus dulcisiconans, Pteronomobius heydenii, Tetrix bipunctata kraussi y Stenobothrus grammicus. Asimismo, se incluyen los primeros datos verificados de Stenobothrus bolivarii y Omocestus viridulus kaestneri y nuevos registros de algunas especies raras: Leptophyes punctatissima, Conocephalus conocephalus, Metrioptera ambigua y Sphingonotus nodulosus.

Palabras clave: Orthoptera, Tettigoniidae, Gryllidae, Tetrigidae, Acrididae, Tetrix bipunctata kraussi, nuevas citas, bioacústica, corología, Portugal.

Introduction

Until recently the Portuguese Orthoptera fauna was relatively poorly studied. In recent years more and more data are being published, e.g. Lock (1999), Miranda-Arabolaza & Barranco (2005), Ferreira et al. (2006, 2007, 2008, 2009), Ferreira (2007, 2009), Ferreira & Grosso-Silva (2008a, b, c) and Schmidt et al. (2009).

In recent years, field trips focussing on Orthoptera were undertaken by the authors. Paulo Lemos has been active especially in the central part of the country. Koen Lock investigated several areas in October 2011. Baudewijn Odé, Luc Willems and Roy Kleukers studied parts of Serra da Estrela and NP Alvao in July 2015.

This has yielded several interesting records. In this paper we present six species new to Portugal: Cyrtaspis tuberculata Barranco, 2005, Natula averni (Costa, 1855), Oecanthus dulcisiconans Gorochov, 1993, Pteronomobius heydenii (Fischer, 1853), Tetrix bipunctata kraussi Sauley, 1888 and Stenobothrus grammicus Cazuro, 1888. Furthermore we present the first documented records of Stenobothrus bolivarii (Brummer von Wattenwyl, 1876) and Omocestus viridulus kaestneri Harz, 1972 and new records of some rare species: Leptophyes punctatissima (Bosc, 1792), Conocephalus conocephalus (Linnaeus, 1767), Metrioptera ambigua Pfau, 1986 and Sphingonotus nodulosus Lluciá-Pomares, 2013.

Material and Methods

The field work has been carried out using several techniques, especially walking slowly through the field with a sweep net, looking for jumping or sitting grasshoppers and listening to the songs. For this cause also bat detectors (Magenta Bat4) were used. Additionally moist areas were inspected for groundhoppers and for tree- and bush dwelling species branches were beaten with a stick, collecting the specimens with an entomological umbrella. The research was performed during the day as well as during the night, when some species of cricket and bush-cricket were active.

Sound recordings have been made with an Olympus LS-100 and Tascam HD-P2 solid state recorder with a Sennheiser microphone (K6-module with ME67 or ME62 condensor microphone) at 96kHz/24bits PCM quality, both in the field and in studio conditions. Analysis of the sound recordings has been performed with Bias Peak software. Oscillograms have been prepared with Praat software.

The collected specimens are stored in the collections of the authors and Naturalis Biodiversity Center in Leiden (the Netherlands). For some specimens DNA samples have been taken (see the RMNH numbers in the locality lists) and these will be processed in the coming years and published via www.boldsystems.org.

Results

New records. 1 female nymph, 8-VII-2015, Serra da Estrela, surs. of Famalicao (district Guarda), N40.44926, W07.365879; alt. 850 m, R. Kleukers, B. Odé, & L. Willems leg., col. Naturalis Leiden (RMNH5014955) (fig. 1).

This cryptic species was mentioned by Miranda-Arabolaza & Barranco (2005) from Serra da Nogueira and...
Ferreira et al. (2007) from Peneda-Gerês National Park. In 2015, a female nymph was caught in a road side verge in a mixed forest in Serra da Estrela (fig. 2). The nymph was raised to adult (fig. 1). It is quite probable that L. punctatissima is much wider distributed in northern Portugal, as the insects have a cryptic lifestyle and the male makes a sound which cannot be heard by the human ear. A batdetector is very useful to detect the species.

- **Cyrtaspis tuberculata** Barranco, 2005
  
  **New to Portugal**
  
  **NEW RECORDS.** Many males and females, 2013-2015, between S. Antonio and Sagres (district Faro), N37.0423, Ñones-Alarcón, 2013). In the past years, it has been found in the province of Málaga (Llucià-Pomares & Quiñones-Alarcón, 2013). This species was recently described on the basis of a single female (Barranco 2005), from Doñana National Park in Andalucia (Spain). The male was described from a population found in the province of Málaga (Luciá-Pomares & Quiñones-Alarcón, 2013). In the past years, it has been found in large numbers in a forest area near Santo Antonio, in the extreme southwest of Portugal (fig. 5). These are the first records from this country. The adult individuals were found from May to November, mostly on Quercus coccifera. The species was recently described on the basis of a single female (Barranco 2005), from Doñana National Park in Andalucia (Spain). The male was described from a population found in the province of Málaga (Luciá-Pomares & Quiñones-Alarcón, 2013). In the past years, it has been found in large numbers in a forest area near Santo Antonio, in the extreme southwest of Portugal (fig. 5). These are the first records from this country. The adult individuals were found from May to November, mostly on Quercus coccifera.

- **Conocephalus conocephalus** (Linnaeus, 1767)
  
  **NEW RECORDS.** 20-X-2011, Povoã do Conde (district Beja), N39.300030, W8.800572, P. Lemos (photo) (fig. 6); 28-X-2012, Évora (district Évora), N38.564772, W7.935537, P. Lemos (photo) (fig. 7).

  Schmidt et al. (2009) provided the first record of C. conocephalus for Portugal: one male was found at Grândola/Ribeira Abaixo in 1998. The species was found on two more localities (fig. 8), near Évora there are records since 2003. The habitat of this species is moist, dense vegetation of especially Cynodon dactylon.

- **Metrioptera ambigua** Pfau, 1986
  
  **NEW RECORDS.** Many individuals, 29-IX-2012, Castro Laboreiro (district Viana do Castelo), N42.039645, W8.156537, P. Lemos (photos) (fig. 9).

  Metrioptera ambigua was first recorded in Portugal at the eastern edge of Peneda-Gerês National Park (Ferreira et al., 2007). It was recently found at Castro Laboreiro, in the northwestern part of the same park (fig. 10). Here, many adults and nymphs were found in low dense vegetation in moist areas, such as margins of brooks. It is a very rare species, which cannot be heard by the human ear. A batdetector is very useful to detect the species.

Until recently, _N. averni_ was only known from the type specimen, which was found around 1850 near Naples (Italy). Since the loud song has become known, _N. averni_ was discovered in many delta areas in southern Europe in the past 10 years (Odé et al., 2011). The species is mentioned here for the first time for Portugal. _Natula averni_ seems to be widespread in the coastal area of Portugal, at least in the southern and central part (fig. 13). The northern limit needs to be established.

_Natula averni_ lives in swampy, mostly brackish habitats. The crickets are hidden in dense, shady vegetation of e.g. Phragmites, Juncus, Spartina, Typha, Sparganium, Iris pseudacorus and Cyperaceae. Adults have been found throughout the year. The crickets jump very quickly and purposeful in the dense vegetation, especially the males. They overwinter in mats of plant material, probably preferring the vicinity of...
roten vegetation, where the temperature is higher. At Poça do Vau males were singing in this kind of vegetation, when the outside temperature was about 9 °C in November. Near Caldas da Rainha longwinged specimens were observed flying very slowly and smoothly, at dusk.

As Odé et al. (2011) point out, the taxonomical status of this taxon has to be investigated further. It is possible that N. averni is conspecific with the widespread N. longipennis (Serville, 1838) or that it comprises of a group of closely related species.

- **Oecanthus dulcisonans** Gorochov, 1993
  **New to Portugal**

- **Oecanthus dulcisonans** was described recently by Gorochov (1993). The song is similar to that of *Oecanthus pellucens* (Scopoli, 1763), but continuous and not with pauses as in *O. pellucens* (Cordero et al., 2009) (fig. 14). Cordero et al. (2009) list a number of locations for *O. dulcisonans* in Spain. We present the first records for Portugal (fig. 15). The species seems to be quite common in the south of the country.

- **Pteronemobius heydenii** (Fischer, 1853)
  **New to Portugal**

  These are the first records of *P. heydenii* for Portugal (fig. 20). The species can be easily distinguished from *Pteronemobius lineolatus* (Brullé, 1835) by its genitalia (fig. 18) and song (fig. 19). It is very probable that *P. heydenii* can be found in other localities in Portugal.

- **Tetrix bipunctata kraussi** Sauley, 1888
  **New to Portugal**
  **NEW RECORDS.** 1 female, 9-VII-2015, NP Alvao, 5 km SE of Ermelo (district Vila Real), N41.335756, W7.863342; alt.: 725 m, R. Kleukers, B. Odé, & L. Willemse, leg. col. Nationalis Leiden (RMNHINS105191) (fig. 21, 22).

  *Tetrix bipunctata* (Linnaeus, 1758) has been reported many times for Portugal, but in the course of history there has been much confusion about this taxon. All old records of *T. bipunctata* are considered to refer to *T. tendalata* (Llorente & Presa, 1981; Ferreira et al., 2006).

  The specimen at NP Alvao (fig. 21, 22) was found at the foot of a rocky hillside, in a muddy area along a stream. The identification is confirmed by Hendrik Devriese. It is the first confirmed record for Portugal (Ferreira et al., 2006) and only the second confirmed record for the Iberian Peninsula (Devriese, 1996, pers. comm. H. Devriese) (fig. 23). *Tetrix bipunctata kraussi* is also known from Sierra Nevada (Andalucia, Spain) (Pascual, 1978; Devriese, 1996). Devriese (1996) studied one specimen of Sierra Nevada and concluded that it differed from specimens of the forma *kraussi* from other parts of Europe and the status should be studied further. The Portuguese specimen has short hind wings (about 2x the length of the fore wings) and therefore belongs to the forma *kraussi*. This forma is considered as a subspecies or even a species by some authors. The current view, based on morphological, ecological and DNA studies, is that these taxa are conspecific and that *kraussi* should be considered a form of *T. bipunctata* (pers. comm. Hendrik Devriese).

- **Sphingonotus nodulosus** Luciá-Pomares, 2013

  *Sphingonotus nodulosus* was described in 2013, from Lagoa de Obidos on the central-western coast of Portugal and is known from several other localities on the Iberian Peninsula (Husmann et al., 2013). We present here an overview of all known Portuguese locations (fig. 25). The species mostly inhabits the dune area in southwestern and central-western part...
of Portugal, which is under threat, especially by building projects. For example the population in Vale de Janelas is threatened by a new touristic resort. It will be very important to protect this very rare grasshopper. The species has been recently assessed for the IUCN red list as Endangered (pers. comm. Axel Hochkirch). When potential harmful activities are planned in the areas where \( S. \) nodulosus occurs, local government should take the effect on the populations into account. See Lemos (in press) for more information on the local threats of this Iberian endemic.

- **Stenobothrus grammicus**

  **New to Portugal**

  **New records.** 6 males and 2 females, 7-VII-2015, Serra da Estrela, W of Penhas da Saúde (district Castelo Branco), N40.30544, W07.56759; alt. 1570 m, R. Kleukers, B. Odé, & L. Willemse leg., col. Naturalis Leiden (RMNH5009713, 5009716, 5015036 (sound recording, fig. 29), 5009708); 9-IX-2014, Cortes do Meio (district Castelo Branco), N40.294928, W7.579424, P. Lemos (photo); 10-VIII-2015, Cortes do Meio (district Castelo Branco), N40.308301, W7.576713, P. Lemos (photo, fig. 27).

  We present here the first records of \( S. \) grammicus for Portugal (fig. 28). The males can be recognised in the field by the rather incurved pronotal keels and clubshaped tips of the antennae (fig. 26). The tip of the palps are black in both sexes (fig. 26, 27). The specimens at Serra da Estrela were found at a rocky mountain side, at high altitude.

- **Stenobothrus bolivarii**


  The dot on the distribution map in the surroundings of Serra da Estrela (Clemente et al., 1989) is the only published record we found for this species in Portugal. However, no details on this record are given and the species is not indicated specifically for Portugal. We present here the first documented records of \( S. \) bolivarii for Portugal (fig. 31). We made a short video of a singing male (www.youtube.com/watch?v=aB_Y2M4JuLw). The recording of the song is not clear enough to be analysed in depth, but the song clearly places the male in the group of \( S. \) grammicus, which comprises only \( S. \) grammicus and \( S. \) bolivarii (Berger, 2008). *Stenobothrus grammicus* can be recognised by the widened, blacktipped palps and the widened tips of the antennae. The last segment of the palps of the studied males are widened, but with an orange colour (fig. 30) and the tips of the antennae are not widened.

- **Omocestus viridulus kaestneri**

  **New records.** 29-IX-2012, Castro Laboreiro (district Viana do Castelo), N42.039216, W8.155912, P. Lemos (photo, fig. 32).

  In the distribution map of *Omocestus viridulus* in Clemente et al. (1990), a dot is indicated in the northwesternmost district Viana do Castelo (although in the text only Spanish localities are mentioned). This dot is the only reference to the presence of *Omocestus viridulus* in Portugal, without any further details on the locality. We present here a recent locality for *O. viridulus* (Iberian subspecies *kaestneri*), confirming that the taxon is present in Portugal (fig. 33).
Discussion

In this paper several interesting new records for the Portuguese Orthoptera fauna are summarised. It is quite remarkable that six new species could be found. This is an indication that much remains to be discovered in Portugal. We expect that especially in the Ephippigerinae and Grylyoidae several new species to the fauna and even to science can be found in Portugal.

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Bibliography


