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On distribution and ecology of the bush-cricket *Polysarcus denticauda* (Orthoptera, Tettigoniidae) in Slovakia

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ABSTRACT. *Polysarcus denticauda* was found in 63 localities and 13% of all squares of the Slovak Fauna Databank, relatively regular throughout Slovakia. Before 2004, the occurrence was known from 28 squares and approximately from 35 localities. In 2004-2009, the authors recorded this species for the first time in 28 localities in 25 DFS mapping squares. Authors suggest that this increase in records is due to intensified mapping. The species was mainly registered in traditionally used mountain hay meadows (71% localities, n = 59), less in lowlands, but only in well-preserved traditional farming hay meadows (29% localities). More than 30% of all localities were situated higher than 1000 m a.s.l. In mountain localities, species was accompanied with *Metrioptera brachyptera*, *Tettigonia cantans*, *Isophya camptoxypha*, *Miramella alpina*, *Pseudopodisma nagyi*, *Psophus stridulus*, and in lowlands also with some rare, sometimes even hygrophilous species: *Gampsocleis glabra*, *Tettigonia caudata*, *Ruspolia nitidula*, *Stethophyma grossum*, *Mecostethus parapleurus* and *Dociostaurus brevicollis*.

KEY WORDS: Orthoptera, zoogeography, habitats, conservation

INTRODUCTION

Polysarcus denticauda (CHARPENTIER, 1825) (syn. *Orphania denticauda*) belongs to the biggest (body length up to 47 mm, weight up to 6 g), unable to fly, herbivorous species of European bush-crickets (Orthoptera, Tettigoniidae) (HARZ 1969). This species is associated with meadow habitats within a considerable altitudinal range from 120 up to 2300 m a.s.l. (HARZ 1969, DETZEL 1998, KAŇUCH & KRIŠTÍN in press.). Species origin is disputable, mostly reported as Pontic or Ponto-Mediterranean (INGRISCH & KÖHLER 1998, DETZEL

1998). Its distribution range spreads from the Pyrenees eastwards probably up to Iran and Iraq, the northern boundary crosses South Poland, Western Ukraine and Central Germany, the southern is represented by populations in Italia, Albania and Greece (LOMNICKY 1879, HARZ 1969) and in the Near East (Fauna Europaea 2004). The recent occurrence in northern parts of the area is patchy: two small and isolated territories in Poland (WANAT & BIALOOKI 1997, BAZYLUK & LIANA 2000), four in Czech Republic (HOLUŠA & KOČÁREK 2007), and northernmost in Germany (MAAS et al. 2002). Mainly from the past, there exist also records of massive occurrence, mainly in lowlands, e.g. in Hungary (NAGY 1983, 1988), Austria (BERG & ZUNA-KRATKY 1997), Slovenia (US 1992) and Slovakia (GULIČKA 1954). In such a way, the species was an important element embedded in food chains (GULIČKA 1954). Today, its occurrence is primarily concentrated in mountain and submountain areas (HOLUŠA 1997, MAAS et al. 2002, KAŇUCH & KRIŠTÍN in press.). In some European countries, it is threatened with intensive agriculture, chemical treatment of meadows or their liquidation. Mainly the populations in lowlands, in West Europe and at distribution range boundaries are strong isolated (DETZEL 1998), occurring only at the most preserved, extensively managed localities not influenced with pesticides.

The aim of this paper is to contribute to the knowledge on the distribution and habitat requirements of this large insect species in Slovakia in relation to its occurrence and protection across Europe.

MATERIAL AND METHODS

In May – October 1994–2009, we checked out 584 localities in 258 mapping squares of the Slovak Fauna Databank, in the following text DFS (60% of total squares in Slovakia, one square area is ca. 132 km^2). The study species was mapped mainly through acoustic identification and localisation. Consequently, stridulating individuals were directly collected by individual collection (less also by sweeping the herbal layer) in the field. We have collated the already-published data on the distribution of the species in Slovakia from 1867 to 2009, including our data (Fig. 1). Unpublished distributional data are described in the following way: code of the Slovak Fauna Databank (Fig. 1) – name of the locality (altitude), number of trapped or listened specimens, and sex [M = male, F = female], date and name of collector (if other than author of the paper).

Assessment of the habitat quality (requirements) was expressed through: 1) habitat type and altitude, and 2) height of herbal layer. These data were collected during the maximum abundance of adults. The habitat type was analysed for 59 localities, considering three main habitat types (traditional farmed lowland meadows under 300 m a.s.l., traditional farmed mountain meadows 600–1000 m a.s.l. and high mountain meadows above 1000 m a.s.l., mostly managed only occasionally). Height of the herbal layer (three classes: 0–10 cm, 10–50 cm and > 50 cm) was recorded on 40 small-plots (each 100 m^2) in two independent current distribution areas (20 plots in lowland and 20 in mountain regions, respectively).

The lowland study sites (Peťov and Bakta) were situated in mesophilous hay meadows (the Juhoslovenská kotlina Basin, 48° 06' 12" – 48° 23' 54" N, 19° 28' 58" – 20° 05' 27" E, exposition S, SE, slope < 10°, 160–280 m a.s.l., 9.1 °C mean annual temperature). Mountain study site (Krížna) were located in mesophilous mountain hay meadows (Veľká Fatra Mts., 48° 53' 12" N, 19° 02' 33" E, exposition WSW, slope 10-40°, 1400-1500 m a.s.l., 2.6 ºC).

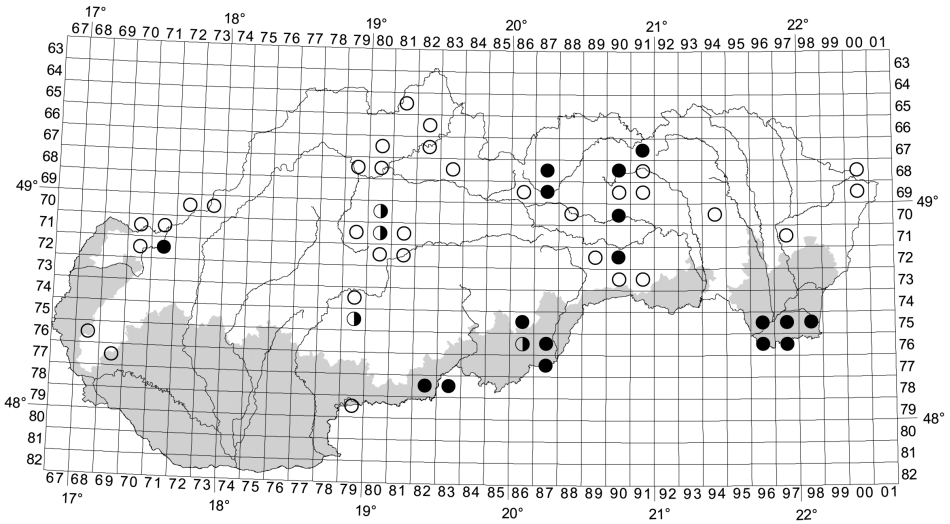

Fig. 1. Distribution of *Polysarcus denticauda* in Slovakia in mapping squares of the Slovak Fauna Databank (empty circles = published data, full circles = unpublished data, semi-full circles = published and unpublished data, light-grey area = Pannonian bioregion, white area = Carpathian [Alpine] bioregion).

RESULTS AND DISCUSSION

Distribution

Summarizing all published and unpublished records, the species has been found in 63 localities and 53 mapping squares, relatively regularly throughout Slovakia (13% of all squares of DFS, Fig. 1). Before 2004, the occurrence of *P. denticauda* was known from approximately from 35 localities and 28 squares. Thanks to more extensive mapping of suitable localities in 2004-2009, the species was found for the first time in 28 localities in 25 mapping squares of DFS. Our species with the South-European and Pontomediterranean

type of distribution can be found across the whole Pannonian and Alpine bioregion of Slovakia. We suggest that this increase in records is due to intensified mapping.

Published data: 6581 square (ANONYMOUS 2007a), 6682 (ANONYMOUS 2006), 6782 (ANONYMOUS 2007b), 6780, 6879, 6880, 6883, 6800/6900, 6891, 6990, 6991, 7080, 7088, 7094, 7170, 7179, 7180, 7181, 7197, 7270, 7280/7281, 7390, 7391, 7479, 7668, 7686, 7769, 7979 (references cited in HOLUŠA 1997), 6986 (CHLÁDEK 2003a), 7171 (CHLÁDEK 2003b, HOLUŠA et al. 2007), 7072, 7073 (HOLUŠA et al. 2007), 7289 (CHLÁDEK 2003c), 7579 (CHLÁDEK 2003a, GAVLAS 2005).

Unpublished data: 6791 - Kyjov (570 m a.s.l.), 8 M, 30. 7. 2009, 6887 – Gerlachov (805 m a.s.l.), 2 M, 4. 7. 2006 (P. Tuček); 6890 – Tichý Potok (700 m a.s.l.), 10 M, 2. 8. 2007 (M. Sárossy); 6987 – Veľký Slavkov (677 m a.s.l), 15 individuals, 19.7.2007 (M. Veľký); 7080 – Ploská, (1510 m a.s.l.), >20 ind., 1. 8. 2004; 7090 – Spišské Podhradie (580 m a.s.l.), 2F, 30. 7. 2009; 7180 – Krížna (1400–1500 m a.s.l.), >100 ind., 20. 7. 2007; 7271 – Ostrý vrch, Myjava (600 m a.s.l.), >10 M, July 1982 (J. Kulfan); 7290 – Hekerová (1200 m a.s.l.), 1 M, 7. 8. 2004; 7579 – Banská Belá (560 m a.s.l.), >10 M, 18. 6. 2003, (V. Gavlas); 7586 – Bakta (280 m a.s.l.), >50 M, 12. 6. 2002; 7596 – Somotor (125 m a.s.l.), >100 ind., 9. 6. 2006; 7597 – Kerestúrska pusta (125 m a.s.l.), >100 ind., 10. 6. 2006; 7598 – Leles, Veľký les (120 m a.s.l.), >100 ind., 14. 6. 2006; 7686 – Rimavské Janovce (180 m a.s.l.), 3 ind., 12. 6. 2002; 7686 – Bakta (280 m a.s.l.), >100 ind., 13. 6. 2002; 7687 – Zádor (165 m a.s.l.), 11 ind., 27. 7. 2007 (M. Sárossy); 7687 – Číž (174 m a.s.l.), 1 ind., 27. 7. 2007 (M. Sárossy); 7687 – Cakov (170 m a.s.l.), 1 ind., 27. 7. 2007 (M. Sárossy); 7696 – V. Kamenec (120 m a.s.l.), >100 ind., 20. 6. 2006; 7697 – Strážne duny (125 m a.s.l.), >100 ind., 10. 6. 2006; 7787 – Rimavská Seč (177 m a.s.l.), 5 ind., 27. 7. 2007 (M. Sárossy); 7882 – Kováčovce (150 m a.s.l.), >100 ind., 13. – 29. 6. 2002; 7883 – Peťov (160 m a.s.l.), >100 ind., 13. – 29. 6. 2002.

Comments on ecology, biology and conservation

In general, the bush-cricket *P. denticauda* is considered to be an orophilous, pratinicolous, geocolous and graminicolous species, inhabiting nowadays especially mesophytic mountain meadows (e.g. INGRISCH & KÖHLER 1998a, DETZEL 1998). It prefers high grass and rich-in-species hay meadows with later mowing (BERG & ZUNA-KRATKY 1997), what we have confirmed also for our study areas. In Hungarian lowlands (Hortobágy National Park), it was collected in mesophytic and less xerophytic vegetation in neighbourhood of either wet or also dry grassy stands (NAGY 1983).

In Slovakia, the species was mainly registered in traditionally used mountain hay meadows (71% localities, n = 59), less in lowlands, but only on well-preserved traditionally farmed hay meadows (29% localities). More than 30% of all localities were situated higher than 1000 m a.s.l., mostly above the upper tree line, in subalpine meadows, where mostly no management was registered. The highest locality was situated at 1630 m a.s.l. (Chleb Mt., Malá Fatra Mts.) and the lowest at 120 m a.s.l. (Somotor, Eastern Slovakia). Probably

as a result of intensive management of suitable localities, the species has not been found yet in the Danube lowland (MAŘAN 1954, KRIŠTÍN 2004, KRIŠTÍN et al. 2004).

Considering the height of herbal layer, the species generally prefers grassy stands taller than 50 cm (55% of localities, n = 40 plots) and stands high between 10 and 50 cm (40%). There are significant differences between lowland and mountain plots – in lowlands it prefers grassy stands taller than 50 cm (70% of localities, n = 20 plots) and avoids stands lower than 10 cm. In mountains, where height of the herbal layer is in general lower, it prefers grassy stands 10–50 cm tall (50% of localities, n = 20 plots), less occurs in stands higher than 50 cm (40%) and rare was found also in stands shorter than 10 cm (10%).

According to the results of our current survey in Slovakia, the species frequently occurs in mountain localities simultaneously with the following, mostly stenovalent mountainous species: *Metrioptera brachyptera*, *Isophya camptoxypha*, *Miramella alpina*, *Pseudpodisma nagyi*, *Psophus stridulus*, *Omocestus viridulus* and in lowlands with the following rare, sometimes even hygrophilous species: *Gampsocleis glabra*, *Tettigonia caudata*, *Ruspolia nitidula*, *Stetophyma grossum*, *Mecostethus parapleurus*, *Dociostaurus brevicollis*, *Aiolopus thalassinus*, mainly in the Východoslovenská nížina Lowland.

In terms of conservation, *P. denticauda* is not registered in the National Red List (KRIŠTÍN 2001). In Austria it is considered as an endangered species (BERG & ZUNA-KRATKY 1997), in Germany, high endangered (MAAS et al. 2002). Following the literature (e.g. MAAS et al. 2002) as well as the outcomes of our research, the destruction and depletion of traditional farming hay meadow habitats, resulting especially from agriculture intensification (chemistry use, biocide application, tillage, growing of agricultural crops, intensive grazing, excessive fertilisation) seem to be the most negative factors affecting the existence of this species. Elimination of the negative processes and, consequently, the proper management and traditional land-use seem to be the most appropriate measures for maintenance and prosperity of this rare risk species.

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