

## Recent expansions of the bush-crickets *Phaneroptera falcata* and *Phaneroptera nana* (Orthoptera: Tettigoniidae) in the Czech Republic

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### Abstract

*Phaneroptera falcata* was known to be widespread only in southern and central Moravia till the year 2000. During the last years, quick expansion to northern Moravia and Silesia (Moravian-Silesian region) has been observed. Based on the sequence of findings, consecutive spreading through Bohemia is also supposed. *Phaneroptera nana* was published from southern Moravia firstly in 2002 with findings from 1992 and 2001. At the present time, occurrence in nine localities is confirmed with the northernmost finding in Brno. Climatic changes associated with the current global warming trend in the last decades together with the increase of abandoned fields and meadows are probably the main reasons of the expansions.

### Zusammenfassung

*Phaneroptera falcata* war bis in das Jahr 2000 in Tschechien lediglich aus Süd- und Zentralmähren als weit verbreitet bekannt. In den letzten Jahren wurde jedoch eine rasche Ausbreitung nach Nordmähren und Schlesien beobachtet. Die zeitliche Aufeinanderfolge der Nachweise macht es wahrscheinlich, dass die Einwanderung durch Böhmen erfolgte. *Phaneroptera nana* wurde in Tschechien erstmals in den Jahren 1992 und 2001 in Südmähren gefunden. Bis 2007 gelangen Nachweise an neun verschiedenen Stellen, die nördlichste davon bei Brno. Klimaveränderungen in Zusammenhang mit der derzeit beobachteten Erderwärmung sowie die Zunahme brachgefallener landwirtschaftlicher Flächen dürften die Hauptgründe für diese Ausbreitungen darstellen.

### Introduction

Species of the genus *Phaneroptera* are long-winged thermophilous bush-crickets which are able to quickly colonize new sites (NAGY 1992). Two species of this genus, *P. falcata* (Poda, 1761) and *P. nana* Fieber, 1853, occur in the Czech Republic. Both species occupy a wide variety of open habitats, from xerothermic vegetation (esp. forest steppes) to wetlands (esp. lowland meadows and floodplain forest edges) including ruderal habitats in towns; but they demand taller herbaceous or shrubby vegetation (or trees) everywhere (KÖHLER 2001).

*P. falcata* is an Euro-Siberian species, distributed from France and Belgium to Japan (KOČÁREK et al. 2005). In the Czech Republic, this species is historically widespread within southern and central Moravia, which is documented by many

published records (survey see CHLÁDEK 1993). Only one single specimen from Horní Radíkov (6857) has been published from Bohemia (ČEJCHAN 1981). From the northern part of Moravia and Silesia (Moravian-Silesian region) the only occasional occurrence of a single specimen has been found in Háj ve Slezsku (6074) (DOBŠÍK & CHLÁDEK 1975). Both records have not been verified during the last 30 years.

The expansion of *P. falcata* to the north has been noticed in several countries of Western Europe (e.g. Germany, Belgium and Russia; see KLEUKERS et al. 1996, DECLER et al. 2000, LANDECK et al. 2005, STOLZENBURG 2005, BOLSHAKOV 2006).

*P. nana* is a circummediterranean species, distributed in Europe, Africa and Asia Minor (KOČÁREK et al. 2005). From the Czech Republic, only records of two single specimens caught near Strachotín (7065) in 1992 and Pouzdřany (7065) in 2001 in the most southern part of Moravia were published by VLK (2002). In the neighboring south-western part of Slovakia, the population of this species has been found for the first time in 1994 by HOLUŠA & VIDLIČKA (1997). At the present time it is known from many localities in southern Slovakia (e.g. MAJZLAN & FEDOR 1997, MAJZLAN et al. 2000, FEDOR 2000, 2001, GAVLAS 2001, CHLÁDEK & GAVLAS 2004 and own unpublished data). The expansion of this species has been observed also in northern Austria (BIERINGER & ROTTER 2001, BERG et al. 2005, ZECHNER & KOSCHUH 2005, archive of Orthopterenkartierung Ostösterreich), France, Switzerland and Germany (CORAY 2003, SARDET et al. 2005, BAUR et al. 2006).

The data about spreading of both *Phaneroptera* species in the Czech Republic are analyzed in this contribution.

## Data base and methods

Data of *P. falcata* and *P. nana* presented in this contribution are based mainly on author's collecting activities carried out during the period 1995-2007. Unpublished data preserved in the collection of O. Ginther in the Museum of Zlín, Czech Republic have also been processed. The majority of *P. falcata* faunistic data were published in a previous conference contribution (KOČÁREK & HOLUŠA 2006). Most of the mentioned material is kept in author's collections. Original data are arranged as follow:

Čejkovice<sup>1</sup> – Špidlák Nature Reserve<sup>2</sup> (7167)<sup>3</sup>, 48°55'1"N, 16°57'33"E<sup>4</sup>, 210<sup>5</sup>, 6.ix.2006<sup>6</sup>, 0/1 and 1n<sup>7</sup>, PK<sup>8</sup>;

<sup>1</sup> = village

<sup>2</sup> = specification of locality

<sup>3</sup> = the grid mapping square code used for faunistic research in the Czech Republic (PRUNER & MÍKA 1996)

<sup>4</sup> = GPS coordinates

<sup>5</sup> = altitude in m a.s.l.

<sup>6</sup> = date of collection (finding)

<sup>7</sup> = number of males, females and nymphs collected

<sup>8</sup> = leg., det. et coll.

Abbreviations: PK – Petr Kočárek, Ostrava; JH – Jaroslav Holuša, Frýdek-Místek; RV – Robert Vlček, Brno; PM – Pavel Marhoul, Praha; TZK – Thomas Zuna-Kratky, Wien (A); JD – Jan Dolanský, Pardubice; OK – Ondřej Konvička, Veselí nad Moravou; BM – Bohuslav Mocek, Hradec Králové (Mocek leg. et det., Regional Museum Hradec Králové coll.).

## Results and discussion

### Published faunistic data

*P. falcata*: individual faunistic records published till 1990 were summarized by CHLÁDEK (1993), all the later by KOČÁREK & HOLUŠA (2006).

*P. nana*: VLK (2002), CHLÁDEK (2006).

### Unpublished faunistic data

#### *P. falcata*:

Horní Lipová – Smrk Mt. (**5768**), 50°13'52.5"N, 17°2'3"E, 1060, 29.viii.2007, 0/1, JH; Krnov – Staré hliniště (**5872**), 50°6'29"N, 17°41'38"E, 325, 14.ix.2007, 0/1 observ., PK & JH.; Kunětická hora – Kunětická horahill (**5960**), 50°4'47.5"N, 15°48'42.5"E, 300, 30.viii.2007, cca 10 ex. observ., 0/1 and 50°4'51"N, 15°48'34.5"E, 240, 30.viii.2007, 0/1, BM; Lázně Bohdaneč – Na Kovárně (**6059**), 50°5'24"N, 15°42'26.5"E, 220, 6.viii.2007, 0/1 ex. documented by photo, JD; Skalice – Profil Morávky Nature Monument (**6376**), 49°39'58.5"N, 18°23'41"E, 20.vi.2007, 370, 6 n., PK; Halenkov – Lušová (**6674**), 49°21'27.5"N, 18°9'5.5"E, 525, 18.viii.2006, 1/0, PM; Maletice (**6751**), 49°13'45"N, 14°11'22"E, 375, 18.vii.2007, 1 ex. observ., PM; Vladislav – syenite slopes (**6761**), 49°12'58.5"N, 15°59'10"E, 420, 2.viii.2007, 3/0, RV; Zahrádka – Častotice (**6762**), 49°14'24"N, 16°5'9"E, 470, 2.ix.2007, 0/1 documented by photo – L. Jeřábková, PM det.; Zdounky (**6770**), 49°13'0"N, 17°19'13"E, 335, 19.viii.2007, 1/1, JH; Vlachovice – Za Hájem (**6873**), 49°7'28.5"N, 17°54'53"E, 415, 30.ix.2007, 0/1, OK; Nedašov – Kaňoury Nature Monument, (**6874**), 49°6'51.5"N, 18°6'24"E, 625, 15.viii.2007, 1 ex., OK; Nedašova Lhota (**6874**), 49°7'18"N, 18°4'48.5"E and 49°7'24.5"N, 18°4'54.5"E, 440, 19.viii.2007, 1 and 3 ex. resp., OK; Jaronice – hill Vráže (**7051**), 48°58'51"N, 14°19'44"E, 405, 30.vii.2006, documented by photo – P. Kouba, PM det.; Starý Hrozenkov (**7073**), 48°58'22"N, 17°52'11.5"E, 490, 8.vii.2007, cca 20 ex. observ., PK; Javorník nad Veličkou – Kománkův Mlýn (**7171**), 48°51'53"N, 17°32'38.5"E, 355, 26.vii.2007, cca 10 ex. observ., OK; Suchov – Suchovské mlýny, (**7171**), 48°53'7"N, 17°34'40.5"E, 385, 26.vii.2007, cca 20 ex. observ., OK; Velká nad Veličkou – Zahrady pod Hájem Nature Reserve (**7171**), 48°53'1"N, 17°31'46"E, 344, 14.ix.2007, 1 ex., OK; Lanžhot – Ranšpurk Nature Reserve (**7367**), 48°40'8"N, 16°56'24.5"E, 150, 5.ix.2006, cca 10 ex. observ., JH.

#### *P. nana*:

Brno – Špilberk (**6865**), 49°11'39"N, 16°35'48.5"E, 230, 20.x.2006, 1/0, RV; Pouzdřany (**7065**), 48°56'39.5"N, 16°38'39"E, 250, 16.ix.2006, 3/0, JH; Drnholec (**7164**), 48°51'41"N, 16°29'44.5"E, 170, 19.x.2006, 1/0 and 48°51'37"N, 16°29'5.5"E, 175, 21.x.2006, 0/1, RV; Hrušovany nad Jevišovkou – centre of the

village (**7164**), 48°49'47.5"N, 16°24'3.5"E, 185, 12.x.2007, 0/1, RV; Mikulov (**7165**), 48°48'33.5"N, 16°38'36.5"E, 295, 18.ix.2006, 3/0, PK; Čejkovice – Špidlázky Nature Reserve (**7167**), 48°55'1"N, 16°57'33"E, 210, 6.ix.2006, 0/1 and 1n, PK; Břeclav (**7267**), 48°44'N, 16°54'E, 160, 31.viii.2006, several males calling in gardens and bushes, TZK; Lanžhot (**7267**), 48°43'N, 16°56'E and 48°44'N, 16°55'E, 150, 31.viii.2006, several males calling in fallow land and edges of street, TZK.

### **Recent expansion of *P. falcata* and *P. nana* in the Czech Republic**

*Phaneroptera falcata* has been widespread historically within southern and central Moravia (CHLÁDEK 1993). In 2000, the first breeding population of this species in northern Moravia was found in Kunín (6373) (KOČÁREK & NĚMEČKOVÁ 2000). Next populations were found during the two successive years in other sites of Poodří Protected Landscape Area – Kunín (6373), Bartošovice-Hukovice (6374), Bartošovice na Moravě (6374) and consecutively many populations were found in the surroundings of the city of Ostrava, and towns of Opava, Karviná and Frýdek-Místek during 2004-2005 (KOČÁREK & HOLUŠA 2006). Recently, records in 11 squares of the faunistic grid of the Moravian-Silesian region are known.

Based on the sequence of findings, we suppose a consecutive spreading through the Moravian Gate (see Fig. 1), which forms the hypothetical bridge between the two warmer Moravian Silesian areas, the southern Moravian lowlands and the Ostravian Basin. The species probably crossed this a bit cooler area, followed by the quick expansion and establishment of many new populations in the Ostravian Basin. There are two main reasons, which could allow the penetration through the gate. (i) Climatic changes associated with higher temperatures in the last decades are generally used as an explanation of the recent expansion of this species in Western Europe (e.g. KLEUKERS et al. 1996, DECLEER et al. 2000, BAH et al. 2003, LANDECK et al. 2005). (ii) The declining of large-scale farming in the Czech Republic after 1989 has been followed by the escalation of local ruderalization of abandoned fields, meadows and pastures (see also HOLUŠA 2003). As *P. falcata* requires taller herbaceous vegetation, this factor could play an important role during the dispersal through the Moravian Gate and could escalate the expansion.

Recently (2006-2007), permanent populations have also occurred in Bohemia, although we have known only several single specimens from this territory: Kunětica – Kunětická hora – hill (5960), Lázně Bohdaneč – Na Kovárně (6059), Malečice (6751) and Jaronice – hill Vráže (7051). Based on these data, several directions of the expansion can be discussed: (i) around the north-eastern edge of the Českomoravská Vrchovina highland along the town of Litomyšl, (ii) along river valleys through the Českomoravská Vrchovina highland and (iii) along the Danube River into the South Bohemian Basin (see Fig. 1). Some of these directions were probably also used during the last post glacial migration by many animal species. Although some localities in the river Jihlava valley, e.g. at Vladislav (6761), had been still considered to be the edge of termophilous southeastern (pannonian) fauna (CULEK 1996), other quite recent expansions of orthopteran species along the river valleys were documented, e.g. by HOCHKIRCH (2002).

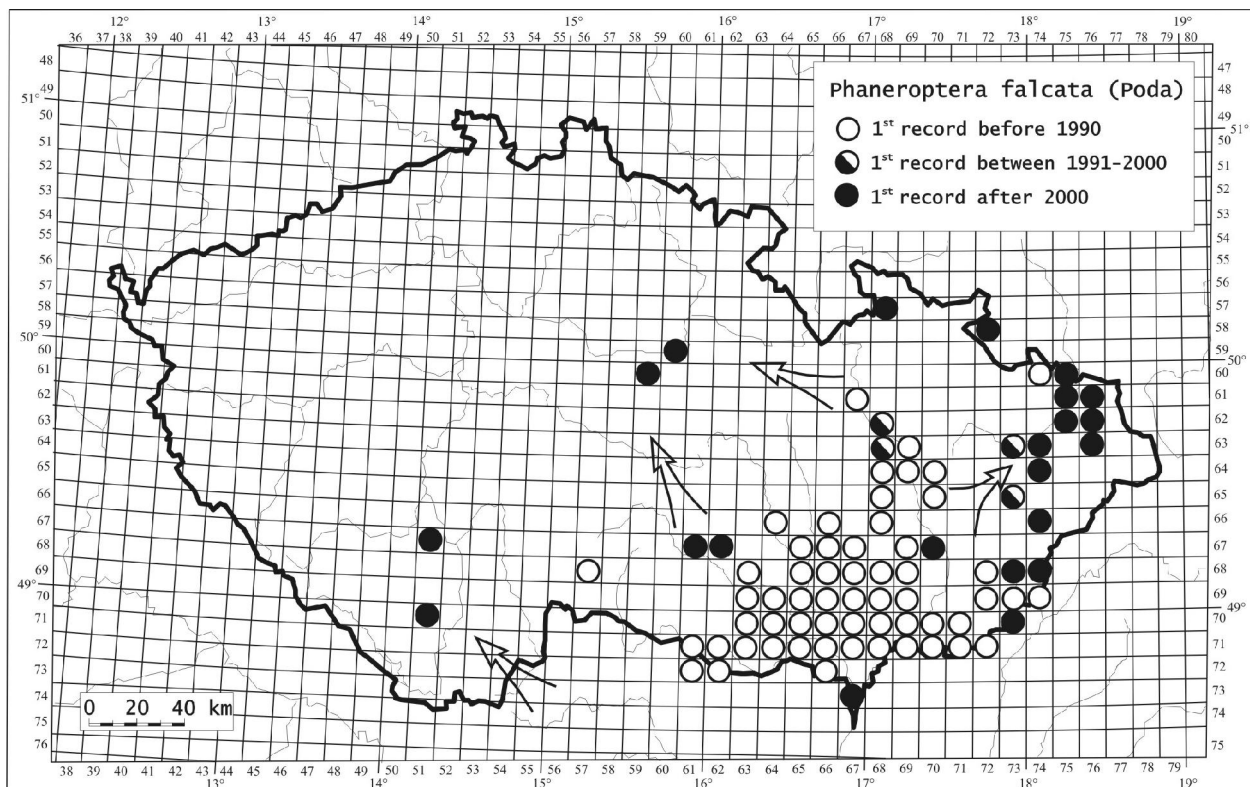


Fig. 1: Distributional map of *Phaneroptera falcata* in the Czech Republic. Arrows mark the probable direction of spreading through the Moravian Gate and into Bohemia.

The occurrence of *Phaneroptera nana* has not been recorded from the Czech Republic up to 1992 (VLK 2002). The author published records of single specimens caught near Strachotín (7065) in 1992 and Pouzdřany (7065) in 2001. Despite the extensive faunistic research carried out in southern Moravia during 2002-2006, other specimens of *P. nana* were not observed till 2006. Finally, during 2006-2007, some specimens of *P. nana* were found in Brno (6865), Pouzdřany (7065), Drnolec (7164), Hrušovany nad Jevišovkou (7164), Mikulov (7165), Čejkovice (7167), Břeclav (7267) and Lanžhot (7267). A very abundant population was observed in the town of Mikulov, where *P. nana* was the dominant member of nightly singing orthopterans in bushes and trees. In comparison with *P. falcata*, this species is more thermophilous and the current northern limit of its range is probably not crossing the latitude of 49°15' in the Czech Republic, which also limits the biogeographical region of the Pannonicum (CULEK 1996).

*P. nana* probably penetrated into the Czech Republic from neighboring Slovakia and Austria in the last two decades (see Fig. 2). Most probably this species followed mainly the lowlands of the valleys of Morava and Dyje rivers that offer suitable habitats like thermophilous ruderal vegetation. But mapping of the occurrence was complicated by the requirements of this species, because it occupies deciduous trees and shrubs and may be only occasionally found on the ground (especially in the second half of October, when temperature may firstly decline to the freezing point during nights; see also HOLUŠA ET VIDLIČKA 1997). So, the species could have penetrated into Moravia earlier, without being detected. However, in the neighboring area of the Austrian Weinviertel the widespread

distribution of this species was also not detected earlier than the second half of the 1990s (archive of Orthopterenkartierung Ostösterreich).

As well as in *P. falcata*, we suppose that the probable reasons of spreading were climatic changes associated with higher temperatures as well as the increase in area of fallow fields and meadows.

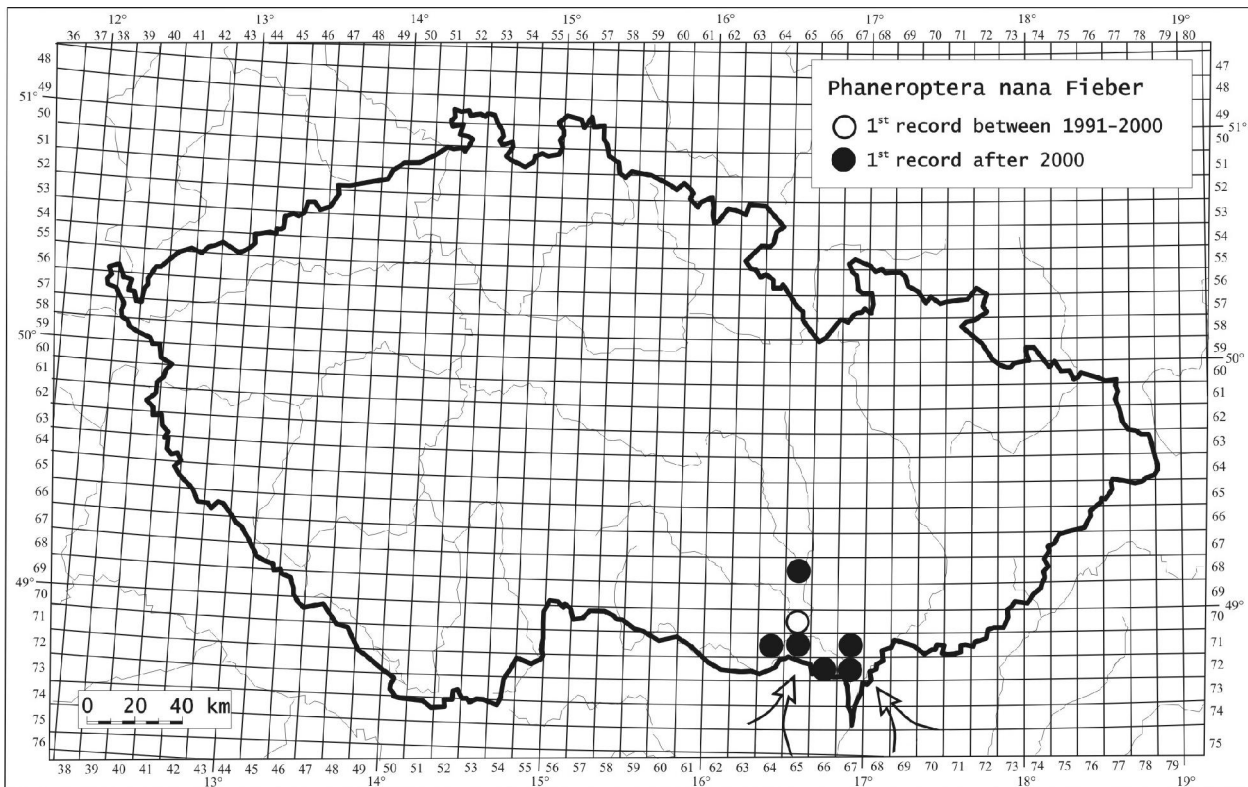


Fig. 2: Distributinal map of *Phaneroptera nana* in the Czech Republic. Arrows mark the probable direction of spreading from Austria and Slovakia.

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