ARTICULATA 2014 29 (1): 1–7 FAUNISTIK

New observation of *Podisma pedestris* (Linné, 1758) forma macroptera (Orthoptera, Acrididae), in the Republic of Macedonia

Michèle Lemonnier-Darcemont & Christian Darcemont

Abstract

Records of macropterous *Podisma pedestris* are rare. Most records from literature are from the eastern Alps (Germany, Austria), and also from Russia and Bosnia and Herzegovina. Our record on the southern border of the Republic of Macedonia is the southernmost of the known records. We found a copula where both the male and female were long-winged, within a furthermore micropterous population. This raises some questions about the determinism of the long-winged form and consequently its actual status.

Zusammenfassung

Beobachtungen von makropteren *Podisma pedestris* sind selten. Die meisten Literaturdaten stammen aus den östlichen Alpen (Deutschland, Österreich) und weiterhin aus Russland und Bosnien-Herzegowina. Unsere Beobachtung an der südlichen Grenze der Republik Mazedonien ist der bisher südlichste Nachweis, darunter auch ein Paar *in copula* innerhalb einer mikropteren Population. Dies wirft einige Fragen über den Determinismus der Langflügelform und damit über ihren tatsächlichen Status auf.

Introduction

Wing polymorphism in European Orthoptera is especially common in Tetrigidae and Gryllidae. Within the Acrididae in several brachypterous species occasionally macropterous specimens occur, mainly in *Chrysochraon, Euthystira, Chorthippus, Melanoplus* and *Podisma.* Within the Ensifera this occurs mainly in *Metrioptera* and *Conocephalus*.

For these taxa, a longer wing seems to be occasional and localized within a population. According to some authors, it could occur in response to the need of migration, for instance related to overcrowding (BEHRENS & FARTMANN 2004, PONIATOWSKI & FARTMANN 2009, 2011). Thanks to a higher mobility observed in macropterous forms (HIGAKI & ANDO 2003, SMITH 2007, GARDINER 2008), it would ease the colonization of new territories (VICKERY 1965. POWERFUL & VOISIN 1999, RUST et al. 2012) and contribute to a better dispersion of populations (SIMMONS & THOMAS 2004, GARDINER 2009, HOCHKIRCH & DAMERAU 2009). This assumption, however, is contradicted by RITCHIE et al. (1987).

Environmental conditions are also supposed to play a role in activating macropterism, especially an increased humidity associated with a lower temperature (RAMME, 1931, BACCETTI 1958, DREUX 1962).

Material and method

There are very few records of macropterous *Podisma pedestris.* In Western Europe it is recorded in France and Italy by CHOPARD (1922) - who also named it "macroptera" - FONTANA et al. (2002) and MASSA et al. (2012), but without disclosing the locations.

From Central and Eastern Europe to the Asian border, UVAROV (1912) recorded it in the Astrakhan region in southern Russia, and a few decades later, BEY-BIENKO & MISHCHENKO (1951) merely mentioned the macroptera form for the former USSR but without any indication of the location.

The few data in the literature come mostly from old collections. These references are summarized by NADIG (1984) and are mainly concentrated in southern Germany, Austria and Bosnia and Herzegovina (Fig. 1 and 2). Recently, photos posted on an internet forum (http://molbiol.ru/) show a macropterous male recorded in wet plains of the Urals, in the region of Orenburg in the south of Russia.

Republic of Macedonia

Our record is a macropterous male and a macropterous female found *in copula* in July 2013 in the southern Balkans, mountain Belasica in southeast of the Republic of Macedonia, at 1680 m altitude (Fig. 3). It was found among a low density population of micropterous individuals, located on a slope in shady side, at the top edge of beech forest. It was recorded late in the day, and we didn't have enough time to verify the presence of other individuals at the station. A few hundred meters above, on the ridge, the typical form of *P. pedestris* was abundant in pseudo-montane grasslands and heathland blueberries (*Vaccinium myrtillus*).

Both specimens were collected and placed in our collection. They both show signs of wear on the wings and tegmina, which suggest that they are quite old. The wings extend to beyond the end of the abdomen in the male (Fig. 4). They are a little bit torn before the apex in the female. This individual also lacks the right hind leg. We have not evaluated their ability to fly.

Results

Our observations differ from data collected by Nadig, who found macropterous specimens of *Podisma pedestris* mostly in dry and hot biotopes with a high altitudinal limit not exceeding 1300 m. However, it should be considered that most of the data from this author come from colder localities than the southern region of the Republic of Macedonia, which could explain the altitudinal shift. Nadig also indicates that the macropterous form is much less geophylous than the micropterous form, with a strong preference for high bushes and shrubs. Our pair was standing motionless on a herb at 40 cm above the ground. But the most important point of this record is the fact that both the male and the female of this copula were macropterous (Fig. 5), amidst a standard micropterous population with a balanced male / female ratio. The table and map below show all the data collected on the macropterous form of *Podisma pedestris*

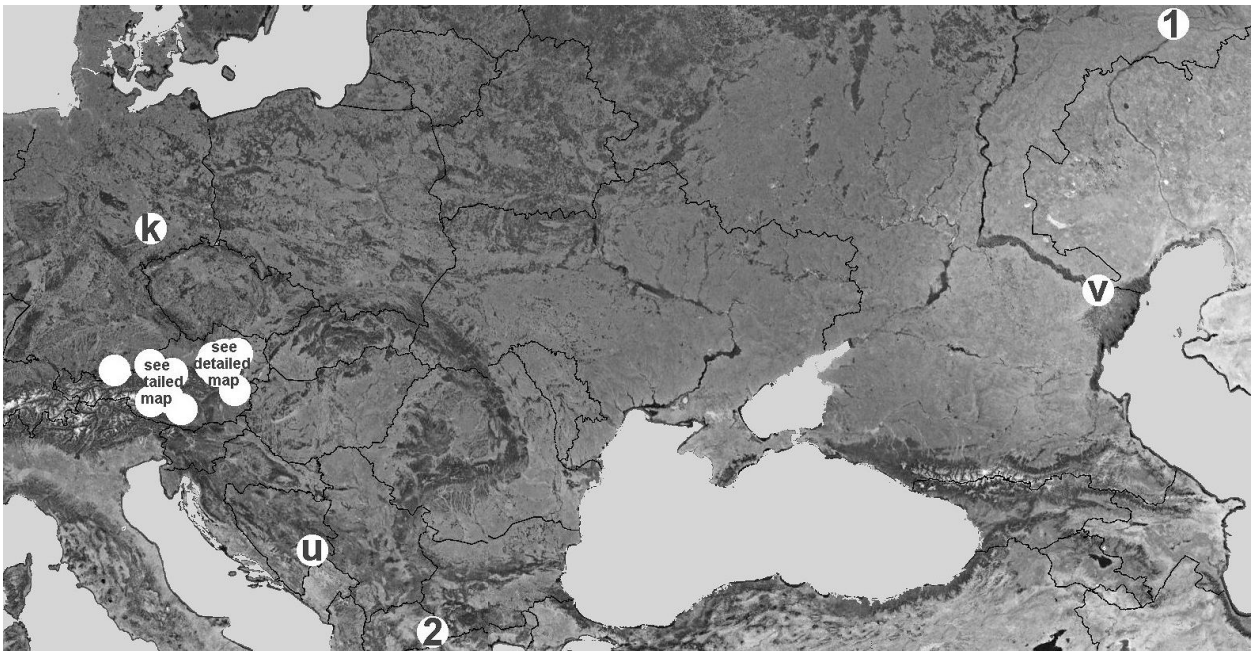

Fig. 1: Map of Literature and recent data of *Podima pedestris f. macroptera.*

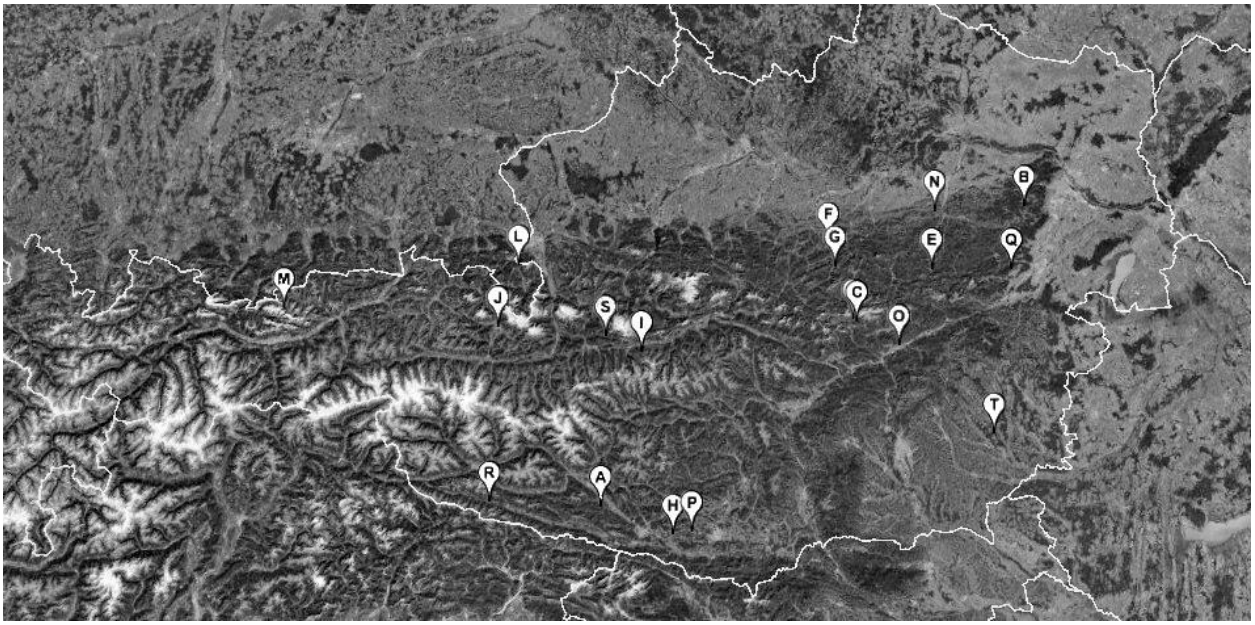

Fig. 2: Map of Literature data in Alps of *Podima pedestris f. macroptera.*

Table 1: Different observations of *Podisma pedestris f. macroptera* in Europe.

Locality	Altitude	Date	Number	Author / Coll.	Map
Austria: Carinthia, Villacher Alpe	1310 m	21.8.1982	2 ♂♂, 1 ♀	Nadig (1984)	A
Austria: Lower-Austria, Parapluiberg	561 m	20.06.1931	1 ♀	Werner coll. & Franz coll. (in Nadig, 1984)	B
Austria: Styria, Hochschwabgeb. - Bodenbauer	1000 m ?	?	1 ♀	Franz coll. (in Nadig, 1984)	C

Locality	Altitude	Date	Number	Author / Coll.	Map
Austria: Styria, Hochschwab - Dullwitz	1350 m	?.07.08.1922	1 ♀	J. Mariani (in Nadig, 1984)	D
Austria: Lower-Austria, St. Aegyd	600-1000 m	16.08.1907	1 ♂, 1 ♀	Werner coll. & Franz coll. (in Nadig, 1984)	E
Austria: Lower-Austria, Langau-Neuhaus	700-1000 m	?.07.1921	1 ♀	Werner coll. & Franz coll. (in Nadig, 1984)	F
Austria: Lower-Austria, Erlaufboden b. Gösing	?	?.07.1923 23.07.1924	1 ♀	Werner coll. & Franz coll. (in Nadig, 1984)	G
Austria: Carinthia, Velden am Wörthersee	?	?.07.1913	1 ♀	Werner coll. & Franz coll. (in Nadig, 1984)	H
Austria: Salzburg, Schladming - Hauser-Kaibling	?	7/08/1922	2 ♂♂	Werner coll. & Franz coll. (in Nadig, 1984)	I
Austria: Saalfelden	744 m ?		1 ♀	Werner coll. & Franz coll. (in Nadig, 1984)	J
Austria: Bettleben b. Altenburg a.d. Rax	?	?.08.1895	1 ♀	Werner coll. & Franz coll. (in Nadig, 1984)	K
Germany: Berchtesgadener Land, Hallthurmpass	700 m ?	1920	?	Ramme. (in Nadig, 1984)	L
Austria: north Tyrol, Solstein - Karwendel	?	1882	?	Heller & Dalla torre (in Nadig, 1984)	M
Austria: Lower-Austria, Göblasbruck	?	1910	?	Ebner (in Nadig, 1984)	N
Austria: Sankt Lorenzen im Mürztal	?	1948	?	Ebner (in Nadig, 1984)	O
Austria: Carinthia, Worstsee	?	1910	?	Puschnig (in Nadig, 1984)	P
Austria: Lower-Austria, "Hohe Wand"	?	1910	?	Ebner (in Nadig, 1984)	Q
Austria: Carinthia, Lesachtal - Birnbaum	?	1925(27)	?	Werner (in Nadig, 1984)	R
Austria: Filzmoos	?	1925(27)	?	Werner (in Nadig, 1984)	S
Styrie: Hammersdorf-Lindegg	?	1927	?	Werner (in Nadig, 1984)	T
Bosnia-Herzegovina: Foca	?	?	1 ♀	Werner coll. & Franz coll. (in Nadig, 1984)	U
Russie: Astrakhan	?	1912	?	Uvarov	V
Russie: Oural-Orenbourg	?	2011	?	http://molbiol.ru/[1]	1
Rep. of Macedonia: Belasica mountain	1680 m	2013	1 ♂, 1 ♀	Lemonnier-Darcemont coll.	2

[1] http://molbiol.ru/forums/lofiversion/index.php/t133669-1700.html.

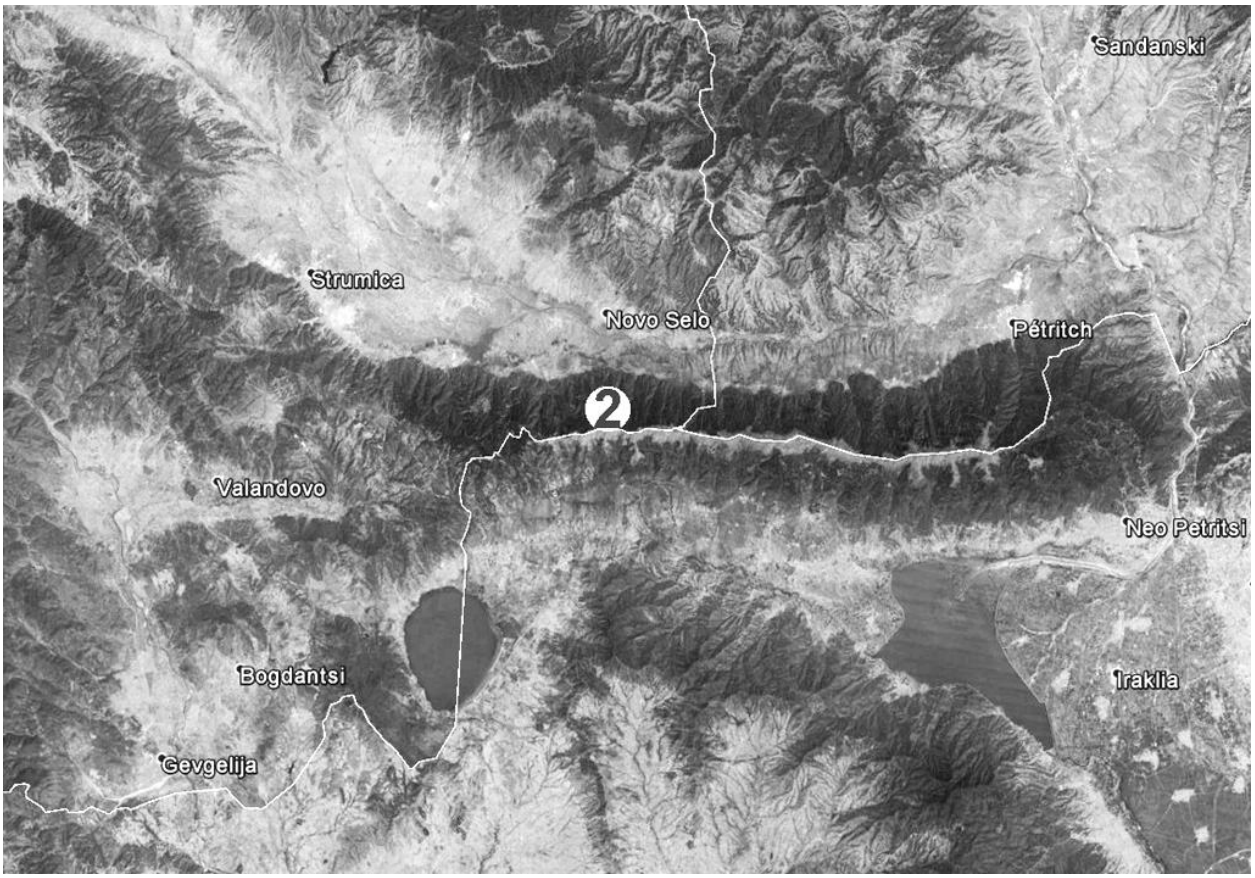

Fig. 3: New locality of *Podima pedestris f. macroptera.* Belasica ; Rep. of Macedonia.

Fig. 4: *Podisma pedestris* f. *macroptera* male.

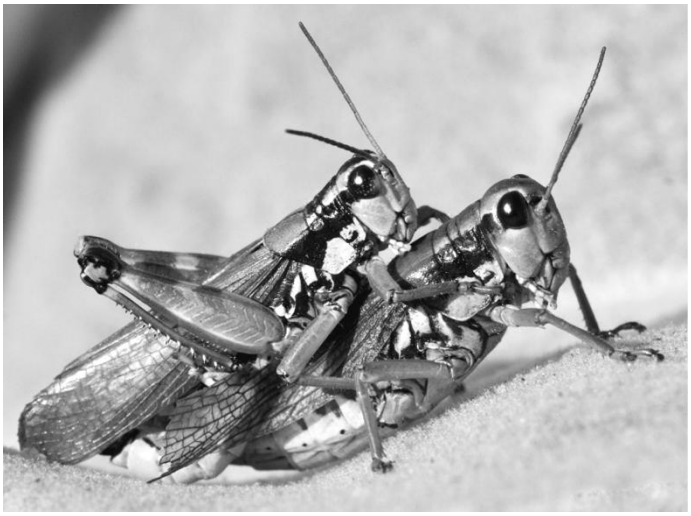

Fig. 5: *Podisma pedestris* f. *macroptera* in copula.

Discussion

The number of records of macropterous individuals of *Podisma pedestris* is rare and the probability to encounter a macropterous specimen remains very low. The probability to observe a macropterous couple *in copula* is extremely low, and this unusual record leads us to several questions:

- Are there examples of cross-mating between macropterous and micropterous specimens?
- Can we assume that there is a particular attraction among macropterous individuals, which could lead to mating only (and not cross-mating) and explain our observation? Couldn't the preference for shrubs be one factor?
- Are the mating among macropterous individuals efficient and what are the characteristics of its potential descendants?

Only an experimental study could enable us to know more about the determinism (genetic base or environmental factor) of these long-winged forms, as, up to now, the answers are unreliable and sometimes contradictory.

Authors:
Michèle Lemonnier-Darcemont, Christian Darcemont
Groupement d'Études Entomologiques Méditerranée (G.E.E.M.)
2 Bis Hameau de St Donat
240 chemin du Vignaou
83440 Callian, France
E-Mail: michele.lemonnier-darcemont@geem.org

References

BEHRENS M. & FARTMANN, T. (2004): Sind hohe Populationsdichten die Ursache der Makropterie beim Gemeinen Grashüpfer (*Chorthippus parallelus*; Caelifera: Acrididae)? – Articulata 19 (1): 91–102.

BEY-BIENKO, G.YA. (1951): Studies on long-horned grasshoppers of the USSR and adjacent countries (Orthoptera, Tettigoniidae). – Trudy Vses. Entomol. Obshch. 43: 129–170 [Russian].

CHOPARD, L. (1922): Faune de France. 3. Orthoptères et Dermaptères. I–VI, 1–212; Paris.

DREUX, P. (1962): Recherches écologiques et biogéographiques sur les Orthoptères des Alpes françaises. – Ann. Sc. Nat. Zool. 12 (3): 323-766.

FARTMANN, T. (2004): Hydrochorie und warme Jahre. – sind das die Gründe für die Ausbreitung der Langflügeligen Schwertschrecke (*Conocephalus fuscus*) in Ostbrandenburg? – Articulata 19 (1): 75–90.

FONTANA, P., BUZZETTI, F.M., COGO, A. & ODE, B. (2002): Guida al riconoscimento e allo studio di Cavallette, Grilli, Mantidi e Insetti Affini del Veneto. – Museo Naturalistico Vicenza, Vicenza, 591 pp.

GARDINER, T. (2008): Orthoptera and allied insects of Essex 2007. – Essex Nat. (N.S.) 25: 72–75.

GARDINER, T. (2009): Macropterism of Roesel's bushcricket *Metrioptera roeselii* in relation to climate change and landscape structure in eastern England. – J. Orthopt. Res. 18: 95–102.

HIGAKI, M. & ANDOY, Y. (2003): Effects of crowding and photoperiod on wing morph and egg production in Eobiana engelhardti subtropica (Orthoptera: Tettigoniidae). – Appl. Entomol. Zool. 38: 321–325.

HOCHKIRCH, A. & DAMERAU, M. (2009): Rapid range expansion of a wing-dimorphic bush-cricket after the 2003 climatic anomaly. – Biol. J. Linn. Soc. 97: 118–127.

MASSA, B., FONTANA, P., BUZZETTI, F.M., KLEUKERS, R. & ODÉ, B. (2012): Orthoptera. – Fauna d'Italia 48: 1-563.

NADIG, A. (1984): Über die macroptere Form von *Podisma pedestris* (Linné, 1758). – Articulata 2: 61–74.

PONIATOWSKI, D. & FARTMANN, T. (2009): Experimental evidence for density-determined wing dimorphism in two bush-crickets (Ensifera : Tettigoniidae). – European Journal of Entomology 106: 599-605.

PONIATOWSKI, D. & FARTMANN, T. (2011): Weather-driven changes in population density determine wing dimorphism in a bushcricket species. – Agric. Ecosyst. Environ. Doi: 10.1016/j.agee.2010.10.006.

PUISSANT, ST. & VOISIN, J.-F. (1999): *Metrioptera (Bicolorana) bicolor* (Philippi, 1830), espèce nouvelle dans les Pyrénées-Orientales, son macroptérisme, comparaison avec *M. (Roeseliana) azami* (Finot, 1892). – Bulletin de la Société Entomologique de France 104: 263-266.

RAMME, W. (1931): Verlust oder Herabsetzung der Fruchtbarkeit bei macropteren Individuen sonst brachypterer Orthopterenarten. – Biol. Zbl. 51: 533–540.

RITCHIE, M.G., BUTLIN, R.K. & HEWITT, G.M. (1987): Causation, fitness effects and morphology of macropterism in *Chorthippus parallelus* (Orthoptera: Acrididae). – Ecol. Entomol. 12: 209–218.

RUST, C., SCHWEBEL, L. (†), SARDET, E. (2012): *Modicogryllus frontalis* (Fieber, 1844), espèce nouvelle en France (Orthoptera, Gryllidae). – Materiaux Orthopteriques et Entomocenotiques 17: 57-62.

SIMMONS, A.D. & THOMAS, C.D. (2004): Changes in dispersal during species' range expansions. – Am. Nat. 164: 378–395.

SMITH, G. (2007): Bush crickets on the menu. – Essex Field Club Newsletter 54: 8–9.

UVAROV, B.P. (1912): Contribution à la faune des Orthoptères des environs d'Astrachan. – Russk. Entomol. Obozr. 13: 99–100; St. Petersburg [Russian].

VICKERY, V.R. (1965): Factors governing the distribution and dispersal of the recently introduced grasshopper, *Metrioptera roeseli* (Hgb.) (Orthoptera Ensifera). – Ann. Entomol. Soc. Quebec 10: 165–172.