

Distribution and conservation status of *Pseudophilotes bavius* (Lepidoptera: Lycaenidae) in Dobrogea (south-eastern Romania)

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Abstract. *Pseudophilotes bavius* (Eversmann, 1832) is a butterfly species of European conservation concern (listed in Annexes II and IV of the Habitats Directive 92/43/EEC) with a restricted and fragmented distribution. In Romania, where it reaches the north-western limit of its range, *P. bavius* has disjunct populations: Transylvania in the north-west and Dobrogea in the south-east, with a gap of about 400 km between the two. In this study we provide an overview on the distribution of *P. bavius* in Dobrogea, while reporting three new sites which double the number of known localities and extend the species' distribution about 60 km north in this region. The known and potential distribution, habitat, phenology and conservation status of *P. bavius* in Dobrogea are discussed.

Samenvatting. Verspreiding en beschermingsstatus van *Pseudophilotes bavius* (Lepidoptera: Lycaenidae) in Dobrogea (Zuidoost-Roemenië)

Pseudophilotes bavius (Eversmann, 1832) is een dagvlindersoort met aandacht voor het Europees behoud (vermeld in de bijlage II en IV van de Habitatrichtlijn 92/43/EEC) met beperkte en gefragmenteerde verspreiding. In Roemenië, de noordwestelijke grens qua voorkomen van de soort, heeft *P. bavius* gescheiden populaties: Transylvanië in het Noordwesten en Dobrogea in het Zuidoosten. Een afstand van 400 km scheidt beide populaties. In dit artikel brengen we een overzicht van de verspreiding van *P. bavius* in Dobrogea terwijl we ook drie nieuwe vindplaatsen vermelden. Hierdoor verdubbelt het aantal gekende plaatsen en is het voorkomen van de soort 60 kilometer noordwaarts uitgebreid. De gekende en potentiële verspreiding, habitat, fenologie en behoudsstatus van *P. bavius* in Dobrogea worden besproken.

Resumé. *Pseudophilotes bavius* (Eversmann, 1832) er en dagsommerfugleart med europæisk bevaringsstatus (inkluderet i tillæg II og IV i Habitatdirektivet 92/43/EØF) og med en begrænset og opspillett udbredelse. I Rumænien, hvor nordvestgrænsen for udbredelsen går, forekommer *P. bavius* i følgende to adskilte områder: Transylvanien i den nordvestlige del af landet og Dobrogea i sydøst, med en afstand på 400 km imellem dem. I denne artikel bringer vi en oversigt over udbredelsen af *P. bavius* i Dobrogea, herunder tre nyopdagede lokaliteter, hvilket fordobler antallet af kendte lokaliteter og udvider artens kendte udbredelse med ca. 60 km nordpå i denne region. Den kendte – og potentielle – udbredelse, habitat, fænologi og bevaringsstatus for *P. bavius* i Dobrogea tages op til diskussion.

Key words: *Pseudophilotes bavius* – Romania – Dobrogea – distribution – habitat – conservation

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Introduction

Already since the 19th century (Mann 1866), the particular butterfly fauna of Dobrogea has attracted numerous researchers who published valuable data on the Lepidoptera assemblages present in this area. One of the most important features that make Dobrogea a very interesting region from a lepidopterological (and not

only) point of view is its geographic position which determines multiple biogeographical influences translated into a meeting point of Balkanic, Minor Asian and south Russian steppe elements. The main ecological and faunistic characteristics of Dobrogea have been discussed by several studies (e.g. Rákósy & Székely 1996, Rákósy & Wieser 2000, Dincă *et al.* 2009). Although some of Dobrogea's most valuable faunistic elements are certainly the many taxa reaching their western or northern distributional limit on its territory, there are also other very localized and endangered butterfly species that have populations in this area. It is for example the case of *Plebejus sephirus* Frivaldsky, 1835, and *Pseudophilotes bavius* (Eversmann, 1832), both of them steppe specialists which have a disjunct distribution in Romania, being restricted to the north-west (Transylvania) and the south-east (Dobrogea) of the country (Rákósy *et al.* 2003, Székely 2008). The populations of *P. bavius* from Dobrogea are of particular interest as they seem to be very isolated from the rest of the species' range lying about 400 km south-east from the Transylvanian ones and equally distant from the ones known from southern Ukraine and Turkey (Kudrna 2002). However, according to the distribution maps of Tshikolovets (2003) and Nekrutenko & Tshikolovets (2005), *P. bavius* occurs in southern Ukraine until the border with northern Dobrogea, meaning that the gap between the populations from Dobrogea and the Ukrainian ones may be actually smaller (about 200 km). Comprehensive data on the distribution and conservation status of *P. bavius* in Dobrogea is still poor as the species has been recorded only from three small sites in the extreme southern part of the province (Fig. 1). Moreover, with the exception of one site, these records were based on very few specimens and on single recording dates. The purpose of this article is therefore to improve the knowledge on the distribution of *P. bavius* in Dobrogea and to tentatively assess its conservation status in this region.

Methods

Between 28th of April and 1st of May 2010, we investigated all the localities with published records of *P. bavius* in Dobrogea as well as other areas that we considered to be potentially suitable for this species. Special attention was paid to sites where *Salvia nutans* (Lamiaceae), the larval food plant of the species, was present. Collecting was done using the insect net.

Results and discussion

Material. 5♂, 2♀, Gura Dobrogei (Constanța county), 28.iv.2010; 2♂, south of Șipote (Constanța county), 29.iv.2010; 6♂, 3♀, south-east of Șipote (Constanța county), 29.iv.2010 and 30.iv.2010; 6♂, 7♀, north of Șipote (Constanța county), 30.iv.2010 and 1.v.2010. We found *P. bavius* at four sites, out of which three represent new records for Dobrogea (Table 1, Fig. 1).

Table 1. Localities in Dobrogea with records of *Pseudophilotes bavius*. Numbers correspond to the localities in figure 1.

No.	Site	Protected area	Date visited	Alt. (m)	County	Lat. N	Long. E	Records of <i>P. bavius</i> in Dobrogea
1	Gura Dobrogei	yes	28.iv.2010	30-100	Constanța	44° 27'	28° 29'	this paper
2	Canaraua Fetei	yes	1.v.2010	25-60	Constanța	44° 03'	27° 38'	Székely 1994
3	N Șipote	no	30.iv.2010 1.v.2010	50-90	Constanța	44° 03'	27° 57'	this paper
4	S Șipote	no	29.iv.2010	70	Constanța	44° 01'	27° 57'	this paper
5	SE Șipote	no	29.iv.2010 30.iv.2010	50-100	Constanța	44° 01'	27° 59'	Rákosy & Székely 1996; this paper
6	Dumbrăveni	yes	30.iv.2010	80-100	Constanța	43° 56'	27° 59'	Dincă & Vila 2008



Fig. 1. Distribution of *Pseudophilotes bavius* in Dobrogea. ● – records of *P. bavius* found in literature; ▲ – new records of *P. bavius* (this paper). The upper left corner indicates the position of Dobrogea (dark grey) in Romania and the part of this province illustrated in the main figure. Numbers refer to localities in table 1.

Certainly, the most important of our findings is the discovery of this species at Gura Dobrogei (Figs. 2, 3), site located in central Dobrogea, about 60 km north-east from the nearest *P. bavius* populations in the southern part of the province (Fig. 1). Gura Dobrogei is a protected area (242.7 ha) of botanical, zoological, geological and speleological interest. The site has a pronounced steppe and (to a lesser extent) forest-steppe character but it also features karstic areas. Although little studied by lepidopterists, previous visits determined promising results (Dincă *et al.* 2009) and determined us to further investigate the area. *Pseudophilotes bavius* was found on grassy calcareous slopes where *S. nutans* was also present. Other species flying in the same area were *Pseudophilotes vicrama* (Moore, 1865), *Colias erate* (Esper, 1805) and *Euchloe ausonia* (Hübner, 1804). It is worth noting that, although the steppe area of Gura Dobrogei is quite large, both *P. bavius* and *S. nutans* were very local and not abundant in the area. As a matter of fact, all specimens we found were confined to a few hundreds of meters long valley and only seven adults were identified during several hours of intensive search by the three authors. The presence of *P. bavius* in Gura Dobrogei considerably extends the known range of this species in Dobrogea (Fig. 1). However, this population is likely to be isolated because, with the exception of Cheile Dobrogei lying only three kilometres to the north, most land in the central part of Dobrogea is used for agriculture and does not offer suitable habitats for this species. At a larger scale, the presence of *P. bavius* in Gura Dobrogei suggests this species may have been more widespread in the past (when maybe larger areas of suitable habitat were probably available), with a potentially more or less continuous distribution between Asia Minor, the Balkans and southern Ukraine. Indeed, by examining the species' distribution map from Kudrna (2002) and taking into account the maps from Tshikolovets (2003) and Nekrutenko & Tshikolovets (2005), it appears that the only large "missing link" between the populations from Asia Minor, the Balkans and southern Ukraine is represented by Bulgaria. However, the presence of *P. bavius* in this latter country is very likely at least in the north-east (near the border with Romanian Dobrogea), where potentially suitable habitats are present (Abadjiev & Beshkov 2007).

Besides Gura Dobrogei, we also identified *P. bavius* in three sites from the surroundings of Şipote village (Constanţa county) (Table 1, Figs. 1, 4–8). At least two of these represent new records for Dobrogea. The species has already been recorded from one site near this village (Rákossy & Székely 1996, Jutzeler *et al.* 1997). However, more precise locality details were not provided and we cannot be sure to which of the three sites investigated by us this citation corresponds (if it corresponds at all). In either case, the population reported from Şipote in the two above-mentioned papers seems to be one of the largest in Dobrogea as 19 males and 12 females were collected in a single day. In table 1, we assigned this population to the site south-east of Şipote (Fig. 5), where we also identified *P. bavius*.

All three sites in the surroundings of Şipote are a mixture of sylvo-steppe areas and calcareous grasslands with small groups of *S. nutans* lying on slopes with steppe-like vegetation. These sites are actually part of a small assemblage of patches of forested areas surrounding the village of Şipote. The entire region is mostly used for agriculture, resulting in a fragmented landscape. Therefore, although the three sites where *P. bavius* was found are separated by no more than five kilometres (site 4 and 5 by only 2 km, see Fig. 1), they are rather isolated from each other by intervening agricultural fields. Preliminary studies focused on a population of *P. bavius* from Transylvania suggested that this species is sedentary, with adults rarely covering distances of up to 330 m (Vizauer & Adumitroaie 2005). In this respect, an interesting observation is that we found no *P. bavius* resting on or flying closely to *S. nutans* and several specimens were found flying rather far from this plant (up to 300 m away). Moreover, at the site north of Şipote (Fig. 7), several specimens (including females) were found on a small calcareous gravel slope flying together with *Scolitantides orion* (Pallas, 1771), about 250 m away from the steppe slopes with *S. nutans*. This is in contrast to the behaviour observed by us in populations of *P. bavius* from Transylvania, where the butterflies were very often resting or flying in the immediate vicinity of *S. nutans*.

The populations of *P. bavius* from southern Dobrogea have been assigned to subspecies *egea* (Herrich-Schäffer, 1852) occurring in Asia Minor (Székely 1994, Rákósy & Székely 1996, Jutzeler *et al.* 1997). The subspecific status of these populations is beyond the scope of this study. However, we are able to report that the populations from Dobrogea do not necessarily fly later compared to the ones in Transylvania as previously mentioned (Székely 1994). It is true that previously available data on *P. bavius* in Dobrogea suggested a later flight time compared to Transylvania since all records were made between 23rd of May and 1st of June. However, our data indicate that the species may well fly during the second half of April (some of the specimens from Gura Dobrogei and Şipote were already very worn out at the end of April), similarly to the populations from Transylvania. Although further research is needed, two variants should be taken into account: (1) the species has considerable variations in phenology depending on climatic particularities of each spring, or (2) it has a prolonged period of emergence.

Conservation of *Pseudophilotes bavius* and its habitats in Dobrogea

Pseudophilotes bavius is currently known from six sites in Dobrogea, out of which three are reported here for the first time (Table 1, Fig. 1). For two of these sites there are only one (Dumbrăveni) and two (south of Şipote) known specimens. For a third one (Canaraua Fetei), there are only three specimens ever collected and none after 1992, despite many visits by lepidopterists in the area since then. Provided directed research is made in suitable habitats, the species might be discovered in a few other sites in Dobrogea. However, one cannot

expect a spectacular improvement in terms of total area of occurrence since only few and highly fragmented patches of steppe and sylvo-steppe areas still survive in Dobrogea, where most of the land is used for agriculture.

The species currently occurs in three protected areas (Table 1). However, none of the sites near Şipote (two of which seem to host the largest populations of the species in Dobrogea), is included in the national network of protected areas. Our observations strongly suggest that these sites are valuable strongholds of the once much more widespread steppe and sylvo-steppe areas from southern Dobrogea, now largely transformed into agricultural fields or intensively grazed pastures. Besides *P. bavius* (a species that already opens the possibility for the designation of Natura 2000 sites), during only two visits at these sites (29th–30th of April 2010 and 5th of July 2010) several other species of conservation concern have been observed:

Lepidoptera:

- *Maculinea arion* (Linnaeus, 1758): one specimen identified on 5th of July 2010 at the site south-east of Şipote (observed by V. Dincă). The species is listed in Annex IV of the Habitats Directive 92/43/EEC and as endangered in the European Red List of Butterflies (Van Swaay et al. 2010).
- *Cupido osiris* (Meigen, 1829): five males observed mud puddling on 5th of July 2010 at the sites south and south-east of Şipote (observed by V. Dincă and S. Cuvelier). The species is protected by law in Romania. In Dobrogea it has not been recorded during more than 140 years (Mann 1866), and never from the southern part of the province.
- *Cupido alcetas* (Hoffmannsegg, 1804): one male observed mud puddling on 5th of July 2010 at the site south of Şipote (observed by V. Dincă). The species is protected by law in Romania and is very poorly known from Dobrogea, with only four reported localities in the whole province (Skolka 1994, Székely et al. 2011).

Other orders:

- *Testudo graeca ibera* Pallas, 1814: several specimens (including one copula) observed on 29th–30th of April 2010 at the site south-east of Şipote (observed by all three authors). The species is listed in Annexes II and IV of the Habitats Directive 92/43/EEC.
- *Hyla arborea orientalis* Bedriaga, 1890: one specimen observed on 30th of April 2010 at the site south-east of Şipote (observed by V. Dincă). The species is listed in Annex IV of the Habitats Directive 92/43/EEC.

The number of protected species occurring in these areas may increase considerably if further research covering a wider spectrum of taxonomic groups is made. With an appropriate documentation, it would be possible to include at least some of these sites into the national network of protected areas. Such a decision would certainly be highly beneficial for *P. bavius* given its apparently small populations (in terms of both area of occupancy and number of individuals) and high habitat fragmentation.



Fig. 2.– Male of *Pseudophilotes bavius*, Gura Dobrogei, 28.iv.2010 (Photo V. Dincă); Fig. 3.– Habitat of *P. bavius* at Gura Dobrogei, 28.iv.2010 (Photo V. Dincă); Fig. 4.– Male of *P. bavius*, south of Șipote, 29.iv.2010 (Photo S. Cuvelier); Fig. 5.– Stepic slope with *Salvia nutans* at the site south-east of Șipote, 30.iv.2010 (Photo V. Dincă); Fig. 6.– Male of *P. bavius*, south of Șipote, 29.iv.2010 (Photo V. Dincă); Fig. 7.– Habitat of *P. bavius* at the site north of Șipote, 30.iv.2010 (Photo S. Cuvelier); Fig. 8.– Flowering buds of *S. nutans*, south-east of Șipote, 30.iv.2010 (Photo S. Cuvelier).

If the suitable sites are saved from agriculture, urbanization or land burning, then the long term survival of *P. bavius* in Dobrogea may only need the maintenance of undisturbed steppe meadows with its larval food plant, *S. nutans*. This could be done with little or no intervention and, only if applicable, through controlled grazing to prevent the habitat being overgrown by bushes and trees.

Pseudophilotes bavius is a species of European conservation concern listed as endangered in the Red Data Book of European butterflies (Van Swaay & Warren 1999) and recently added to Annexes II and IV of the Habitats Directive 92/43/EEC (with the accession of Romania and Bulgaria in 2007). However, in the recent European Red List of Butterflies (Van Swaay *et al.* 2010), based on IUCN conservation criteria, *P. bavius* appears as "least concern" in Europe and as "not evaluated" in the EU member countries. This status is rather surprising if we compare it to many much more common and/or widespread European species listed under higher risk categories ("near threatened", "vulnerable" or "endangered"), among which even some congeners such as *Pseudophilotes panoptes* (Hübner, [1813]) or *P. vicrama*, both evaluated as "near threatened". According to Van Swaay *et al.* (2011), it is a Species of European conservation Concern of the third category (SPEC3), with decline of more than 10% in at least a third of European countries. On the other hand, according to the Climatic Risk Atlas of European Butterflies (Settele *et al.* 2008), *P. bavius* is a species under very high climate change risk, with potential future loss of suitable climatic niche of up to 85%–95%. As *P. bavius* is currently known to occur in only two countries in the European Union (Romania and Greece) and in the vicinity as well from local populations in Serbia, Former Yugoslav Republic of Macedonia and Albania (Kudrna 2002, Slamka 2004, Radović *et al.* 2008), we hope the results presented in this study will stimulate further research on this threatened butterfly and will also contribute to a better knowledge on its distribution and conservation status in Europe.

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