

Notes on the distribution and ecology of Balkan populations of the *Plebeius idas* – group (Lepidoptera: Lycaenidae)

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Abstract. The *Plebeius idas* – group in the Balkans is represented by at least two taxa, *croatica* Grund, 1913 and *baldur* Hemming, 1934, which differ morphologically and ecologically, but their relationship is unknown and data on both taxa are extremely scanty. This report briefly reviews the available information regarding the distribution and ecological preferences of both taxa, and provides new distributional and ecological data on Bulgarian populations of *baldur*. The Balkan endemic *Chamaecytisus absinthioides* (Fabaceae) is identified as a larval host plant. It is suggested, based on their coinciding ranges and field observations, that at least Bulgarian *baldur* is monophagous on *C. absinthioides*. Some possible implications of these observations are discussed, including the suggested *bona species* status of *baldur*.

Резюме. Групата на *Plebeius idas* е представена на Балканския полуостров с най малко два таксона, *croatica* Grund, 1913 и *baldur* Hemming, 1934, които се различават както по външни белези, така и по екологичните си предпочитания. Тези два таксона и техните взаимоотношения са много слабо познати. Тук се обобщава наличната информация за тях и се съобщават нови данни за разпространението и екологията на българските популации на *baldur*. Хранителното растение на гъсениците е балканския ендемит *Chamaecytisus absinthioides* (Fabaceae). Въз основа на теренни наблюдения и забележителното съвпадение на ареалите им се предполага, че поне в България *baldur* е вероятно монофаг на *C. absinthioides*. Обсъждат се някои следствия от тези наблюдения върху възможния видов статус на *baldur*.

Key words: Lepidoptera – Lycaenidae – *Plebeius* – *idas* – *baldur* – larval host plant – *Chamaecytisus absinthioides* – Balkans – Bulgaria

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Introduction

What mainstream lepidopterology currently defines as ‘*Plebeius idas*’ is in reality a heterogeneous complex of taxa with an enormous distribution encompassing most of the Palearctic and a large section of the Nearctic. Taxonomists disagree on the systematic treatment of this complex to the extent that some (e.g. Scott 1986, Gorbunov 2001) consider all taxa to belong to a single, highly polymorphic species whereas others (e.g. Bálint & Johnson 1997, Tuzov *et al.* 2000) separate it into widely varying numbers of morphologically defined species-level taxa. While the latter, ‘splitter’ position is yet to gain wider acceptance, it is becoming increasingly clear that some taxa of this group exhibit not only morphological but also essential ecological differences from nominotypical *idas* (see e.g. Jutzeler *et al.* 2003). Detailed biological data and comparison of pre-imaginal stages are lacking for most taxa of the *idas*– group but where such are available, they indicate that certain morphological traits of adult as well as pre-imaginal stages agree with differences in ecology, including larval host-plant preferences. Therefore, in terms of communicating biologically important information—which is one of the primary goals of biological systematics—there is little to be gained and much to be lost by lumping all of the

idas– group taxa into a single species. In this light, it is necessary to take into account ecological data in an eventual re-assessment of the status of such taxa.

Available data on the Balkan populations of the *idas*– group

Phenotypes and their distribution and known ecology. Morphologically the populations of the *idas*– group in the Balkan Peninsula appear to belong to at least two phenotypes, which can be categorized as ‘mediterranean’ and ‘continental’. The first is characterized by a small size in both sexes (wingspan 20-28 mm, cf. Grund 1913, Neustetter 1938); the upperside in males is of lighter blue with narrow black margins and in females with extensive blue suffusion. This phenotype was described as *Lycaena argyrognomon* Brgstr. var. (nov.) *croatica* Grund, 1913 (locus typicus Croatia: Mt. Velebit and Sebenico [Sibenik]). The taxon *Lycaena argyrognomon (idas)* subsp. *dalmatina* Neustetter, 1938 (locus typicus Croatia: Mt. Biokovo) was stated to possess exactly the same external characters as *croatica*, which is why I consider it to be a junior subjective synonym of the latter. These populations are said to occur only in the karst massifs with mediterranean or transitional climate (but see below!) along the Adriatic coast of former Yugoslavia (Grund 1913, Neustetter 1938, Sijarić *et al.* 1984). On Mt. Durmitor *croatica* inhabits “xerothermic” habitats with *Genista* spp. from 600 to 1900 m (Sijarić *et al.* 1984).

The second group of populations occupies the interior of the Peninsula with continental climate. Morphologically it is clearly different from the first group: both sexes are larger; the male upperside has darker, purplish-blue ground colour with wide black marginal border and black-suffused veins; the female upperside is always brown, with no or very limited basal blue suffusion. These populations are currently referred to the nominal taxon *Lycaeides argyrognomon baldur* Hemming, 1934 (Hesselbarth *et al.* 1995; Olivier *et al.* 1998), a replacement name for *Lycaena argyrognomon balcanica* Züllich, 1929 (locus typicus Bulgaria: Rila Mts.; Hercegovina: Vucija Bara). Olivier *et al.* (1998) considered it fully possible for an older name to exist for this taxon, given its relatively wide distribution, but I have been unable to find any such valid name. The distribution of *baldur* is not exactly known, but includes at least the mountains of the central and partly southern Balkan Peninsula (Tolman & Lewington 1997: 106, as “*idas magnagraeca*”), Turkey except the extreme north-east, the Great Caucasus and possibly other regions of south-eastern Europe (Hesselbarth *et al.* 1995; Olivier *et al.* 1998). This taxon occurs in an altitudinal range of 500–3000 m in Turkey (Olivier *et al.* 1998), in the Balkans between 500 and 2000 m (Tolman & Lewington 1997: 106; Coutsis & Ghavalas 2001; own data). No reliable data on larval host plants exist for this taxon (see below). Contrary to *croatica*, *baldur* is mesophilous or xeromesophilous and avoids xerothermic or mediterranean habitats both in Turkey (Olivier *et al.* 1998) and Bulgaria (own data).



Fig. 1. A male *baldur* roosting on the host plant *Chamaecytisus absinthioides* in the late afternoon. Southwestern Bulgaria, central Pirin Mts., 1750 m, 2.VII.2003. Photo: Z. Kolev.

The relative distributions of these two morphologically and ecologically different taxa is a matter of considerable interest. Unfortunately very little published information exists and the situation has not been a matter of specific studies (Sijarić *et al.* 1984: 130; M. Šašić, *in litt.*). For example, the distribution map of “*Plebejus idas*” in former Yugoslavia (Jakšić 1988: 101) does not distinguish between these two taxa in any way. Apparently in the western Balkans these two groups of populations occur in close proximity, and the external characters of the two “races” have been noted to form a cline apparently coinciding with the transitional zone from mediterranean to continental climate (Sijarić *et al.* 1984: 130). The same authors, however, provide an interesting bit of information that conflicts their previous statement, namely that the “race” *croatica* is obligately monovoltine regardless of the altitude and climatic conditions whereas a population of the “continental race” occurring in the vicinity of Velebit (Lic, 500-600 m) has two generations (Sijarić *et al.* 1984: 129). Lic is situated on the mediterranean western macroslope of Velebit and in that region there thus appears to be an overlap of the ranges (sympatry?!) of the mediterranean “race” (*croatica*) and the so-called “continental race” (*baldur*?)

which unfortunately the authors did not describe in more detail. I am however inclined to disagree with these authors, whose opinion of *croatica* as an ecological (mediterranean) form of *idas* is clearly inconsistent. This taxon occurs in mountains farther away from the Adriatic coast which have clearly continental (not mediterranean) climate such as Durmitor (interestingly, these authors themselves described the massif as a cold, central-European type of mountain despite the presence therein of some limited xerothermic localities) and Galičica in Republic of Macedonia (cf. Schaidler & Jakšić 1988: plate 18, fig. 14), where one would expect the larger and darker phenotype to occur instead. Based on what limited information is currently available to me, I thus prefer for the time being to regard *croatica* as a taxon with relatively well-defined characters (regardless of climatic conditions), which appears to be endemic to the karst massifs of the Dinaric mountain chain. Clearly, however, the morphological characters of the populations of the *idas*- group along the mediterranean-continental transition zone of the western Balkans deserve more detailed studies.

Larval host plants. Malicky (1961) and Jutzeler (1989, 1990) studied in detail host plant utilization by Swiss *idas*. They found it to be polyphagous, the larvae feeding on a number of plant species belonging to genera *Astragalus*, *Onobrychis*, *Melilotus*, *Trifolium*, *Medicago*, *Lotus*, *Helianthemum* and, rarely, *Hippophae*. In Finland, apart from *Trifolium* and *Lotus*, also *Calluna*, *Empetrum* and *Vaccinium* are cited for nominotypical *idas* (Marttila *et al.* 1992).

By contrast several other taxa, morphologically differing more or less from *idas*, are reported to be mono- or oligophagous. Tolman & Lewington (1997: 106) reported that the taxon *calliopsis* Boisduval, 1832 (locus typicus France: Grenoble) is monophagous on *Hippophae rhamnoides* L. (Eleagnaceae). Two Tyrrhenian insular endemics recently separated at species level from *idas*, namely *Plebeius bellieri* (Oberthür, 1910) from Corsica and Sardinia and *P. villai* (Jutzeler, Leigheb, Manil, Villa & Volpe, 2003) from Elba, are monophagous on *Genista*, though larvae accept *Cytisus* in captivity (Jutzeler *et al.* 2003). As was already mentioned, the taxon *croatica* is implied to use *Genista* spp. based on its habitat type (Sijarić *et al.* 1984: 129). Olivier *et al.* (1998) succeeded in recording the most likely host plant (*Astragalus*) of the taxon *altarmena* Forster, 1936 which ‘replaces’ *baldur* in north-easternmost Turkey and Transcaucasia. Hesselbarth *et al.* (1995) and Olivier *et al.* (1998) stressed that no data on the bionomics of *baldur* are available, and cited data for *idas* from Switzerland obtained by e.g. Malicky (1961) and Jutzeler (1989, 1990). However, there is published information for Greek “*P. idas magnagraeca* Verity, 1936”, a taxon which should be considered a junior subjective synonym of *baldur* on account of their entirely identical appearance. Tolman & Lewington (1997: 106) provided the following information on larval host plants: “Vernon Mts., *Genista depressa*; Rhodopi Mts., *Cytisus villosus*. Pupates amongst leaf-litter or on leaves of LHP. Larvae/pupae attended by *Formica pratensis*.” The source of these data is not stated (although it is likely that they are based on T. Tolman’s own observations in Greece) and their reliability therefore is unknown. In particular, I seriously doubt the identity of “*Cytisus villosus*” as the larval host

plant in Rhodopi because this mediterranean species is not known to occur in the said massif (Andreev *et al.* 1992). It is very probable that this record is due to confusion with the similar in habitus *Chamaecytisus absinthioides*, which is widespread in Rhodopi throughout the whole altitudinal range of *baldur* (see below). Thus any trustworthy biological data on *baldur* would be of considerable interest.

New data on *baldur* in Bulgaria

Until relatively recently Bulgarian populations of the *idas*-group were considered to belong to *Plebeius argyrognomon* (Bergsträsser, 1779) and there still seems to be some confusion between the two. For the first time Ganev (1983) identified “*idas*” for the fauna of the country from Rhodopi Mts. Numerous records have been published since then from the massifs Rhodopi, Rila, Pirin and Belasitsa (Abadjiev 2001). Some records cited by Abadjiev (2001) come from predominantly xerothermic regions at very low altitudes, e.g. the towns of Sandanski (Krzywicki 1981) and Melnik (Lehmann 1990). However, this strongly disagrees with the actual habitat preferences of *baldur* (see below) and therefore I suspect that those records refer to the more thermophilous *argyrognomon*. There have been no studies on the habitat preferences and possible host plants of *baldur* in Bulgaria so far.

Since 1987, I have found *baldur* in a number of localities in four Bulgarian mountain ranges as follows:

Rhodopi: • the road from Prevala pass to Perelik chalet, 1800–1900 m; • “Rozhen” astronomical observatory, 1750 m.

Rila: • the tourist route from Predela pass to Kapatnik peak, 1200–2000 m; • Kirilova Polyana, 1400–1500 m; • Dûlgi Rid ridge, 1600–1700 m.

Pirin: • Disilitsa river, the tourist route from Dobrinishte village to “Gotse Deltchev” chalet, 1300 m; • the road and tourist route from Popovi Livadi chalet to Orelek peak, 1500–1800 m; • the tourist route from Popovi Livadi to Sveshtnik peak, 1500–1800 m.

Alibotush (Slavyanka): • Hambar Dere gorge, 1200–1600 m. First record from this massif.

In my experience, Bulgarian populations of *baldur* appear very localized, which raises the intriguing question of why this is so. After all, were the available bionomical data on *idas* (see above) to apply also to *baldur*—as Hesselbarth *et al.* (1995: 601) seem to believe based on the fact that all host-plants of Swiss *idas* (see above) also occur in Turkey—then *baldur* should be expected to be much more widespread and common in Bulgaria, as most of these plants are widespread in Bulgaria (Andreev *et al.* 1992). In 1999 and 2003 I paid special attention to this taxon with the aim of determining its habitat preferences and larval host plants.

Larval host plant. In Mt. Rila at ca. 1700 m above Rilski Manastir, I observed oviposition by a single *baldur* female in July 1999 on *Chamaecytisus absinthioides* (Janka) Kuzm. (Fabaceae). This is a Balkan endemic considered by some Western-European authors a synonym of *C. eriocarpus* (Boiss.)

Rothm. (e.g. Polunin 1997: 284 [implication, based on stated characters and range]; Tolman & Lewington 1997: 56). For the purpose of the present paper I shall adhere to the status of *absinthioides* as a separate species, as it is unanimously separated from *eriocarpus* at species level in recent Bulgarian botanical literature (Andreev *et al.* 1992; Velchev *et al.* 1992; BSBCP 2002). Oviposition on a single species of course does not preclude the use of other Fabaceae species or even genera. The following circumstances however suggest that *baldur* may be monophagous on this plant in Bulgaria. Firstly, the distribution of *C. absinthioides* and *baldur* coincide significantly in the country; this is the only *Chamaecytisus* species with such a distribution in Bulgaria (Fig. 2). Until now *baldur* has not been found on Mt. Osogovo, but the Lepidoptera of this mountain are very poorly studied, and there can be little doubt that purposeful search taking into account the data reported here will uncover this taxon there. Secondly, all populations of *baldur* observed by myself were always localized in the immediate vicinity of bushes of *C. absinthioides*, with adults of both sexes resting and roosting (sometimes in considerable numbers) on leaves, seed pods and inflorescences of the plant (Fig. 1). Such behaviour is not shown toward any other plant in the habitats of *baldur*, and explains the extreme localization of its populations. In fact, in my experience the most reliable way to detect the presence of the butterfly is through a search for this plant. Tolman & Lewington (1997: 106) reported exactly the same close association with the host plant in adults of the taxon *calliopsis*, which is said to be monophagous on *Hippophae rhamnoides* L. Thirdly, my observations on a population of *baldur* in central Pirin in July 2003 failed to show females taking any interest in any of the numerous Fabaceae (*Onobrychis*, *Trifolium*, *Medicago*, *Anthyllis*) present in abundance in the same habitat.

Habitat. Suitable habitat for *baldur*, at least in Bulgaria, is therefore defined by the presence of *Chamaecytisus absinthioides*. Presently the altitudinal range of this plant extends from 500 to 2500 m (Andreev *et al.* 1992). This is an early successional plant that is among the first to populate disturbed ground in the forest zone of Bulgarian mountains, for example areas burned by forest fires, slopes razed by avalanches, clear-cuts, ski runs, pastures, roadsides etc. (Andreev *et al.* 1992; pers. observ.). The primary distribution of *C. absinthioides* in an undisturbed vegetational succession under the currently prevalent climatic conditions is confined almost exclusively to the upper forest and lower subalpine zone, especially towards the natural tree line, where it occurs in very strong populations inside the thinning forest as well as immediately above the timber line (pers. observ.). It can therefore be concluded that both this plant and *baldur* owe much of their occurrence at lower altitudes to human activities such as logging, animal husbandry, or road building that have not only created suitable habitats but perhaps also facilitated the physical dispersal of seeds of the host plant.

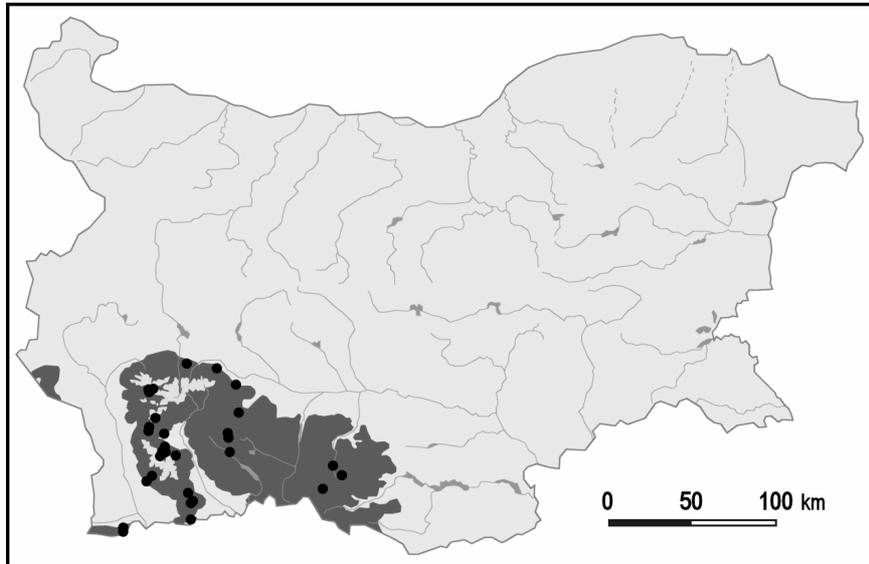


Fig. 2. Records of *baldur* in Bulgaria (black dots) superimposed onto the approximate range of *Chamaecythus absinthioides* (dark grey solid colour), the latter drawn according to data from Andreev *et al.* (1992), Velchev *et al.* (1992), BSBCP (2002) and personal observations.

Biogeographical considerations. An interesting parallel exists between *baldur* and *Colias caucasica* Staudinger, 1871 (Pieridae). In Bulgaria both are, as far as known, monophagous on *C. absinthioides* (cf. Abadjiev 1994 for *C. caucasica balcanica* Rebel, 1901), though elsewhere different host plants have been reported for both (Tolman & Lewington 1997). Finally, the ranges of *baldur* and *caucasica* resemble each other considerably (the mountains of the Balkan Peninsula, Turkey and Caucasus), even though the range of *caucasica* is much more disjunct. It is therefore not far-fetched to theorize a similar evolutionary history for both taxa, which presumably evolved in the mid- to late Pleistocene in northern Asia Minor and thence colonized the Balkans across the land bridge connecting the two regions during one of the Pleistocene glacials.

With regard to the distribution of *baldur*, an interesting circumstance needs to be noted here. Recent European butterfly guides (Tolman & Lewington 1997: 106; Tolman 2001: 86; Tshikolovets 2003: 50) portray the distribution of “*idas*” as being continuous between Central- and Eastern Europe and the Balkan Peninsula. In reality, there is a considerable gap which at its widest extends across the central and northern parts of Bulgaria, as seen in Fig. 2. This gap is also clearly seen on the map in Kudrna (2002: 246), where the nearest records of “*idas*” to the north of the Bulgarian range of *baldur* appear to be in lowlands of southernmost Romania along the Danube just north of Bulgarian territory. To a lesser degree such a gap can be seen on the map of “*idas*” in former Yugoslavia

(Jakšić 1988: 101) between the main mountain chains in the south and west and the plains along the Danube in the north and north-east.

The existence of a discontinuity between the ranges of *baldur* and other populations of the *idas*-group to the north, assuming it is not an artefact due to uneven sampling effort in different regions of the Balkans, may be explained by the Pleistocene isolation of the two taxa in different refugia. In support of this possibility, it must be noted that a strikingly similar allopatry in the Balkans exists between the closely related *Lycaena hippothoe* (Linnaeus, 1761) and *L. candens* (Herrich-Schäffer, [1844]). The Balkan as well as total range of the latter species mostly corresponds to that of *baldur* (cf. Hesselbarth *et al.* 1995).

The records of “*idas*” from the northern Balkans in close proximity to Bulgaria suggest that such populations may be found in the northern lowlands of that country. I have not yet been able to ascertain the taxonomic status of the northern Balkan “*idas*”. According to collection material examined by myself (in Zoological Museum – Helsinki) and published illustrations (Tshikolovets 2003) populations that phenotypically correspond well to nominotypical *idas* are widespread in the lowlands of Central and Eastern Europe north of the Balkans. For the time being, I am therefore inclined to think that the lowland populations of the northernmost Balkan Peninsula will turn out to correspond better to nominotypical *idas* rather than to *baldur*. This problem too is in need of further detailed studies.

Conclusion

Although being apparently closely related to Central- and Northern-European (nominotypical) *idas*, *baldur* differs from the former in two notable respects. Firstly, there are fairly stable morphological differences between the two, namely the very wide black marginal border and the darker, purplish-blue ground colour on the male upperside of *baldur* males and the absence, or nearly so, of blue suffusion in *baldur* females. It has to be noted that in these characters, and thus in overall appearance, *baldur* is very close to another taxon of the *idas*-group, *nevadensis* (Oberthür, 1896), restricted to S Spain. Recent studies suggest that characters such as these may correlate with a distinctness at the species level in at least some taxa of the *idas*-group (Jutzeler *et al.* 2003). Secondly, while *idas* and *baldur* are similar in that both are mesophilous and avoid xerothermic or mediterranean conditions, the data reported here show that *baldur* is characterized by monophagy in a substantial part of its Balkan range, quite unlike the polyphagous habits of Central- and Northern-European *idas*. There appears to be a gap between the ranges of these two taxa in the central and northern Balkans, which perhaps has to do with the hypothesized Anatolian origin for *baldur*. All this lends some credence to the viewpoint of Bálint & Johnson (1997), who treated *baldur* as specifically distinct from *idas*. However, the situation probably cannot be satisfactorily resolved without phylogenetic studies of the *idas*-group that involve DNA analysis.

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