

Pyrgus andromedae (Lepidoptera: HesperIIDae) at the southernmost limit of its distribution: the Pirin Mountains in Bulgaria

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Summary. A new record for *Pyrgus andromedae* (Wallengren, 1853) from the Pirin Mts. in Bulgaria is reported, confirming its occurrence in the country. The biology and habitat preferences of this species in Bulgaria are discussed and its projected range is shown to be extremely restricted, covering an area of less than 18 km². The possible threats to its habitat are critically evaluated, its conservation status is discussed and appropriate conservation measures are recommended.

Samenvatting. *Pyrgus andromedae* (Lepidoptera: HesperIIDae) aan de zuidelijke grens van zijn verspreiding: het Piringebergte in Bulgarije

Een nieuwe waarneming van *Pyrgus andromedae* (Wallengren, 1853) wordt vermeld uit het Piringebergte in Bulgarije, waardoor de aanwezigheid van deze soort in Bulgarije wordt bevestigd. De biologie en habitatpreferenties van de soort in Bulgarije worden besproken en er wordt aangetoond dat het mogelijke verspreidingsgebied in dat land erg beperkt is met een oppervlakte van minder dan 18 km². De mogelijke bedreiging van de vindplaats en de beschermingsgraad van de soort worden kritisch besproken, en beschermingsmaatregelen worden voorgesteld.

Résumé. *Pyrgus andromedae* (Lepidoptera: HesperIIDae) à l'extrême sud de sa distribution : les monts Pirin en Bulgarie
On signale une nouvelle observation de *Pyrgus andromedae* (Wallengren, 1853) dans les monts Pirin en Bulgarie, confirmant la présence de cette espèce dans le pays. La biologie et les préférences écologiques de cette espèce en Bulgarie sont discutées, montrant que sa distribution est extrêmement limitée et couvre une aire de moins de 18 km². On envisage les menaces possibles, on discute son statut de conservation et recommande des mesures de conservation appropriées.

Keywords: *Pyrgus andromedae* – Bulgaria – Faunistics

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Introduction

Pyrgus andromedae (Wallengren, 1853) is a European endemic with Arctic-alpine distribution covering the mountains of Fennoscandia, Polar Ural, the Alps, the Pyrenees, the Romanian and Ukrainian Carpathians, and the Dinarid chain in former Yugoslavia (Tolman & Lewington 2008; Settele *et al.* 2008; Kolev 2010). Its occurrence in Bulgaria was first reported from the northern part of the Pirin Mts. "based on two specimens from IZS" (the collection of the Institute of Zoology – Sofia), with the remark that the occurrence of the species in Bulgaria "needs confirmation" because it is "known by museum specimens only" (Abadjiev 2001). Later, Kolev (2002) gave a compelling justification why these records should be considered doubtful, which is discussed in more detail below; he also reported a third, previously unpublished record from the same region. With only three known specimens and a very restricted range, *P. andromedae* is arguably the rarest and least known HesperIIDae species in Bulgaria. A confirmation of its occurrence (representing the southernmost limit of this species' range) and further studies of its distribution and biology are therefore highly desirable.

The origin of the two ISZ specimens that are the basis for the original report deserves further comment. During a study of the collection of Mr Alexander Slivov now deposited at ISZ, one of us (ZK) discovered a number of specimens with doubtful or erroneous locality data, including specimens that have evidently been collected outside the country but bear labels with Bulgarian location data. The numerous cases of mislabeling lead to

the conclusion that data from Mr Slivov's collection should be considered doubtful and used very carefully, if at all (Kolev 2002). In the course of this study, the two *P. andromedae* specimens mentioned in the original report were also examined as they are part of Mr Slivov's collection. In fact, *P. andromedae* was the only one of six species, reported as new to Bulgaria based on materials from this collection, for which an independent confirmation was obtained: one male reportedly captured in the same region (the Kazana cirque in N Pirin) by Dr Zoltan Varga in 1970 (Kolev 2002). It is to be noted, however, that *P. andromedae* is conspicuously absent from a paper dedicated to the butterflies of the high mountains in Bulgaria, authored by both Dr Varga and Mr Slivov, in which material from N Pirin is abundantly reported (Varga & Slivov 1977). Such omission is difficult to explain, even more so because the authors must have been aware that the species had never been reported from the country. This casts further doubt on the credibility of the three existing records for *P. andromedae* from Bulgaria; thus, although the Northern Pirin locality data seem plausible, they can be accepted only after detailed analysis and independent confirmation.

Material

One of us (NS) has tried unsuccessfully to locate this species during several expeditions in the vicinity of the Vihren peak in Northern Pirin for three consecutive years (2009–2011). Another expedition was undertaken on July 15, 2012, along the trail from the Vihren hut to the Kazana cirque, parts of which were not explored in

previous years. A single female *P. andromedae* was observed, photographed, and collected (coll. Z. Kolev) at an altitude of 2350 m (41°46'2"N, 23°24'42"E). The specimen (shown in Figs. 1 and 2) can be unmistakably identified as *andromedae* by the following characters typical of *P. andromedae*: presence of three basal white spots on forewing upperside, presence of a basal spot in

the discoidal cell of hindwing underside, and white streak-and-dot "exclamation mark" near the anal margin on hindwing underside (Fig. 1: 1–3; see also Dincă *et al.* 2008, Kolev 2010). For comparison, *Pyrgus cacaliae* (Rambur, 1840), the only species with a somewhat similar habitus (which occurs in N Pirin at similar altitudes), is also shown in Fig. 1.

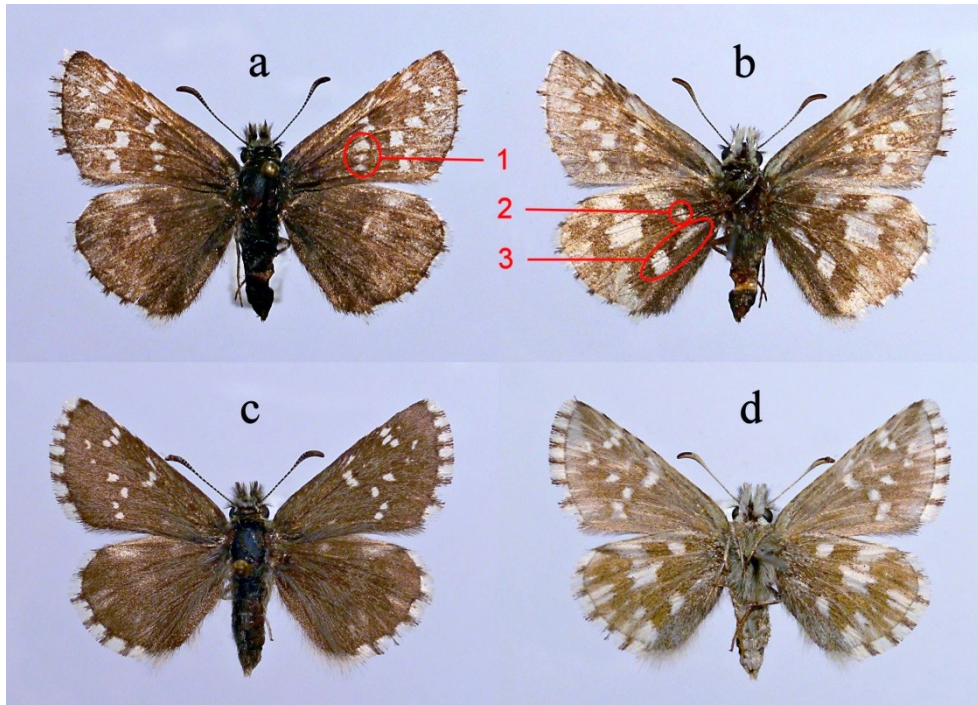


Fig. 1. a, b.– *Pyrgus andromedae*, female, SW Bulgaria, Northern Pirin (41°46'2"N, 23°24'42"E, 2350 m), 15.07.2012, N. Shtinkov leg., in coll. Z. Kolev; a: upperside, b: underside.

c, d.– *Pyrgus cacaliae*, female, SW Bulgaria, Rila, Marishki peak, 2700 m, 2.08.1992, leg. et coll. Z. Kolev. Red symbols: distinguishing characters of *andromedae* vs. *cacaliae*, as follows:

1. presence of three clear white dots in a straight line below the white dot in the forewing discoidal cell;
2. white dot in discoidal cell on hindwing underside;
3. white streak and dot forming an "exclamation mark" between cell and anal margin on hindwing underside.

Habitat

The reported specimen of *P. andromedae* was found on a steep, dry, rocky alpine slope with sparse vegetation (Fig. 2b), less than 100 m from several large patches of *Dryas octopetala* L. (Rosaceae). According to Gros (1998) and Wagner (2003), this is the only larval host-plant of *P. andromedae*; reports for feeding on other plants, e.g. *Potentilla* sp., *Alchemilla glomerulans* Buser (Rosaceae), and *Malva* sp. (Malvaceae) (Tolman & Lewington 2008) seem to be unsubstantiated. The association of *P. andromedae* with this plant has been commented on by other authors (Eliasson *et al.* 2005; Dincă *et al.* 2008) and is corroborated by the present report. It is also confirmed by the communication of Z. Varga that he collected the aforementioned specimen of *P. andromedae* in the Kazana cirque sitting on a cushion of the plant (pers. comm. to ZK, 19.01.2002). *Dryas octopetala* forms localized communities on calcareous terrain in the alpine and subalpine belt of several high mountains in Bulgaria (Roussakova 2011), but is most widespread in Northern Pirin. In the vicinity of the Vihren peak, in particular, *D. octopetala* forms extensive colonies starting at about 2350 m and is absent at lower altitudes (Shtinkov, pers. obs.). Based on these observations, we conclude that

suitable breeding habitat for *P. andromedae* is present throughout the alpine belt of the marble part of Northern Pirin at altitudes above approx. 2300 m.

Range

The inferred range of the species in the Pirin Mts. is shown in Fig. 3. Calcareous rock at suitable altitudes is found in a continuous strip from the Vihren peak (2914 m) north to the Kamenititsa peak (2710 m) and in a small disjunct area in the immediate vicinity of the Sini Vrah peak (2516 m, also known as Sinanitza) (Zagorchev 1995). It is notable that all four Bulgarian records of *P. andromedae*, regardless of their reliability, come from this region (also shown in Fig. 3). The two ISZ specimens have labels "Pirin, G.[ipfel] Vihren 2400 m, 3.8.1970 Al. Slivov, Wiese" and "Pirin, Kamenit.[itsa] cirkus [=cirque] 1900–2100 m, 24.7.[19]82, Slivov". The first label, although somewhat imprecise, probably refers to the Kazana cirque, which is also the origin of the specimen collected by Dr. Varga (Kolev 2002). The altitude indicated in the second label lies considerably lower than the altitudinal range of the breeding habitat and may have been wrongly recorded; apart from that all three previous records appear plausible.

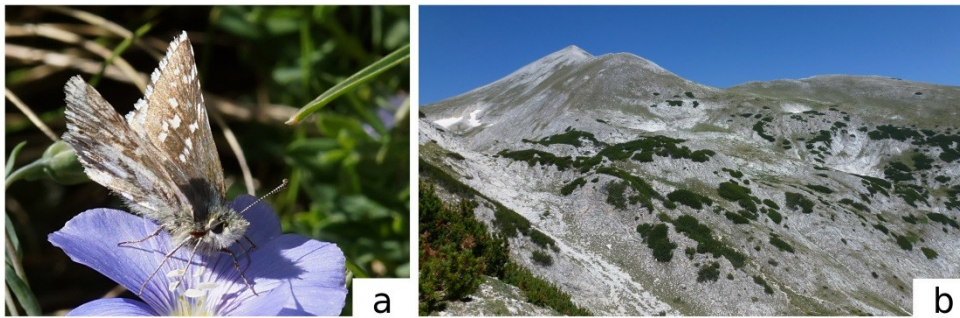


Fig. 2. a.– *Pyrgus andromedae* female, 15.07.2012, Northern Pirin (41°46'2"N, 23°24'42"E, 2350 m); b.– Habitat of *P. andromedae* in Northern Pirin.

The occurrence of *P. andromedae* in other high mountains in Bulgaria seems unlikely as the larval food-plant occupies very limited areas in Rila, Stara Planina, and Slavyanka (also known as Alibotush) (Roussakova 2011). Among those, only Slavyanka has extensive karst areas at high altitude similar to those in Northern Pirin that could support a viable population. A zoogeographic comparison shows that other alpine species characteristic for Northern Pirin such as *Pyrgus cacaliae* (Rambur, [1839]), *Erebia orientalis* Elwes, 1900, *Erebia rhodopensis* Nicholl, 1900, *Erebia cassioides* (Reiner &

Hohenwarth, 1792), *Erebia gorge* (Hübner, [1804]), *Euphydryas cynthia* ([Denis & Schiffermüller], 1775), and *Boloria pales* ([Denis & Schiffermüller], 1775) are absent from Slavyanka which has a maximum altitude of only 2212 m (Abadjiev 2001; Kolev, pers. obs.). On the other hand, unlike those species, *P. andromedae* is known to reach very low altitudes (600–800 m in the Austrian Alps) following the distribution of its larval food-plant (Dincă *et al.* 2008); thus, its occurrence on Slavyanka cannot be completely ruled out without further studies.

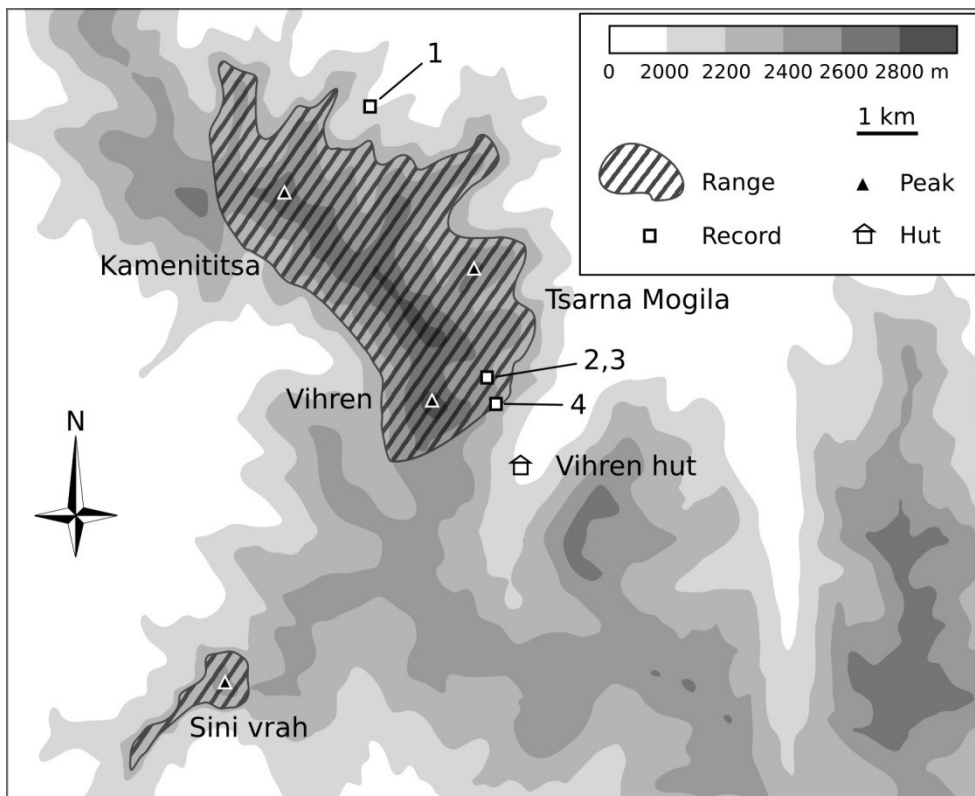


Fig. 3. Distribution of *Pyrgus andromedae* in Northern Pirin and relevant landmarks. Hatched area shows projected range, records are shown with squares.

- 1: Kamenititsa cirque, 1900–2100 m, 24.07.1982 (coll. IZS);
- 2: Vihren, 2400 m, 3.08.1970 (coll. IZS);
- 3: Kazana cirque, 1970 (Kolev, 2002);
- 4: 41°46'2"N, 23°24'42"E, 2350 m, 15.07.2012 (new record).

Conservation status

P. andromedae is a species of considerable conservation interest because of its European endemic status and limited global range; in addition, the population in the Pirin Mts. is the southernmost known location for this species. The estimated range of *P. andromedae* in Northern Pirin (Fig. 3) covers a total projected area of less than 18 km², although the actual area containing suitable habitats is probably much smaller since parts of the area are occupied by moist

alpine meadows with dense, tall grass unsuitable for *D. octopetala*, or by barren rock with no vegetation at all (Shtinkov, pers. obs.). This makes *P. andromedae* the alpine butterfly with the most restricted resident range in Bulgaria. It is also important to note that the entire Bulgarian range of the species lies within the limits of Pirin National Park and the northernmost part around Kamenititsa is within the biosphere reserve Bayuvi Dupki – Dzhindzhiritsa. The area is also part of the Natura 2000 network of protected zones.

Although precise data for the population size and density are lacking, the species appears to be very rare in Bulgaria. This is indicated by the fact that the Pirin region has been extensively studied starting with several expeditions in the beginning of the 20th century (Buresch 1918; Drenowsky 1920); yet for more than 90 years only four specimens have been recorded, including the present report. Part of this is probably due to under-recording because of the difficult terrain and the early flight period of the species: although Bulgarian records span from mid-July to early-August, records from the Romanian Carpathians (Dincă *et al.* 2008) and the Slovenian Alps (Verovnik *et al.* 2012) at comparable altitude and latitude indicate that its flight peak is in late June, which is considerably earlier than the late-July to early-August flight period of most other alpine species. Two further expeditions to N Pirin undertaken by us in 2013 (on July 3 and August 1) were also unsuccessful, in spite of the intensive search in suitable habitat at altitudes 2300–2600 m, and of the fact that the timing of the first expedition was chosen to be near the presumed flight peak of the species. Thus, in spite of possible under-recording, it seems that the population density of *P. andromedae* in N Pirin is rather low.

The mountain communities of *Dryas octopetala* that form an essential part of the habitat base of *P. andromedae* are considered Endangered in the Red Data Book of Bulgaria (Roussakova 2011), with overgrazing and tourism listed as threats. Livestock grazing in the Pirin National Park is strictly regulated (Grancharov 2008); it was much more extensive in Pirin during the last century and has consistently decreased in the Vihren area of Northern Pirin since the mid-1990s (Dimitrova *et al.* 2004: 102). Tourism, too, does not seem to have a major impact on the species habitat base at present. The region is extremely popular with both local and international tourists, with more than 430,000 visitors in 2007 to the Vihren area alone. Most of those visits are during the winter season for ski-tourism, but tourism pressure during the summer months remains high with 9,000–13,000 visits monthly (Grancharov 2008). However, most of the area containing suitable habitat for *P. andromedae* is situated on difficult, steep mountain terrain and only small parts of it are accessible via several narrow hiking trails in the summer. In addition, it is currently not affected by the existing skiing infrastructure which is built mostly on the neighbouring Todorka ridge east of the Vihren hut; this ridge is composed of granitic rock (Zagorchev 1995) unsuitable for the calciphilous *Dryas octopetala*. Therefore, habitat destruction and degradation by tourism are likely negligible for now; however, the plans of the municipal administration for restoration of abandoned infrastructure below the Tsarna Mogila peak (see Fig. 3) and the continuing push for construction of new skiing infrastructure within the limits of the National Park (Anonymous 2012) could

rapidly change the situation. Finally, it is worth noting that a recent assessment of the risk posed by climate change to European butterflies concluded that *P. andromedae* is in the low risk category (Settele *et al.* 2008).

The available data so far do not allow us to assess whether the species satisfies the IUCN criteria for threatened or near-threatened status nationally, and it appears that a Data Deficient status is currently appropriate (IUCN 2012). Nevertheless, *P. andromedae* is of high conservation interest in view of its extremely restricted range in Bulgaria (area of occupancy < 20 km²). Conservation measures should include as a minimum monitoring of the population and enforcement of the existing protection regimes in the park and in the reserve. Further research is needed in order to gather information on the population size and dynamics and on the phenology of the species, establish the exact area of occupancy, ascertain the existence of a population around Sini Vrah, and determine if further conservation measures are needed in Bulgaria. To accomplish these goals, we also recommend including this species in the existing wildlife monitoring scheme in the Pirin National Park.

Conclusion

We report a new record for *Pyrgus andromedae* from Bulgaria (N Pirin Mts.), confirming its occurrence in the country; this record also represents the southernmost known locality for this species. The habitat requirements of the species are analysed based on direct observation and literature data and its projected range is estimated to include the marble ridges of N Pirin situated at an altitude higher than 2300 m, encompassing a total area of less than 18 km². A critical analysis of possible threats shows that habitat destruction or degradation to the extent required for threatened status seem unlikely in the near future; nevertheless, there are reasons for concern. Due to the lack of data on its population size and dynamics, a Data Deficient national red list status is proposed; however *P. andromedae* is of high conservation interest due to its very restricted range in Bulgaria. Recommended conservation measures include monitoring and enforcement of the existing regulations in the protected zones and urgent research.

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