

Colias caucasica balcanica (Pieridae) rediscovered in Montenegro, with additional new records for Serbia

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Abstract. The only two records of *Colias caucasica balcanica* Rebel, 1901 from Montenegro date from the beginning of the XXth century. During our visit of Mt. Durmitor in 2013, the presence of this species was confirmed for Montenegro. Four new localities for Serbia are provided and the confirmation of two already known localities on Mt. Kopaonik. Wing characteristics of male specimens from Montenegro were compared with those from Greece and Bulgaria. Data on habitats according to EUNIS classification and conservation status as well as distributional map of *C. caucasica balcanica* in Serbia and Montenegro are given.

Samenvatting. *Colias caucasica balcanica* (Pieridae) herondekt in Montenegro en nieuwe gegevens voor Servië. De enige twee meldingen van *Colias caucasica balcanica* Rebel, 1910 uit Montenegro stammen uit het begin van de 20^{ste} eeuw. Gedurende ons bezoek aan Mt. Dumitor in 2013 werd de aanwezigheid van deze soort in Montenegro bevestigd. Vier nieuwe lokaliteiten in Servië worden meegedeeld en de aanwezigheid van de soort in twee reeds bekende lokaliteiten op Mt. Kopaonik wordt bevestigd. Vleugelkenmerken van mannelijke exemplaren uit Montenegro worden vergeleken met deze uit Griekenland en Bulgarije. Informatie over de habitats volgens de EUNIS-indeling, de beschermingsstatus, en een verspreidingskaart van *C. caucasica balcanica* in Servië en Montenegro worden gegeven.

Résumé. *Colias caucasica balcanica* (Pieridae) redécouvert au Monténégro et de nouvelles données sont apportées pour la Serbie

Les deux seuls rapports de *Colias caucasica balcanica* Rebel, 1910 au Monténégro datent du début du 20^{ième} siècle. Lors de notre visite au Mont Dumitor en 2013, la présence de cette espèce au Monténégro a été confirmée. Quatre nouvelles localités en Serbie sont communiquées et la présence de l'espèce dans deux localités déjà connues au Mont Kopaonik est confirmée. Les caractères des ailes des spécimens mâles du Monténégro sont comparés avec ceux de la Grèce et de la Bulgarie. Informations sur les habitats selon la classification EUNIS, le statut de protection, et une carte de répartition de *C. balcanica caucasica* en Serbie et au Monténégro sont donnés.

Key words: *Colias caucasica balcanica* – Montenegro – Serbia.

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Introduction

Colias caucasica balcanica Rebel, 1901 is the European subspecies of the nominotypical *Colias caucasica* Staudinger, 1871. The subspecies was firstly described by Rebel (1901), from material collected in Bosnia and Herzegovina. Rebel considered the butterfly as a mountain variant of *Colias myrmidone* Esper, 1781. This assumption was based on the larger size of the butterfly, and its considerably darker and more vivid orange ground-colour (Rebel 1901, 1903, 1904), the collected specimens were therefore named *Colias myrmidone* var. *balcanica*.

Schawerda (1939) was the first to consider *Colias myrmidone* var. *balcanica* and the nominotypical *Colias myrmidone* as two separate species. Later E. Reissinger (in Wagener 1990) established the relationship of the Balkan populations to *Colias caucasica*. This assumption has been followed since by the majority of entomologists.

The nominotypical *Colias caucasica caucasica* has a distribution occupying mountains of eastern Turkey and part of the Caucasus. The Balkan populations inhabit the montane zone at an altitude between 850 and 2300 m, and their distribution ranges from mountains of Bosnia

and Herzegovina in the north to northwestern Greece in the south, and from Croatia (Tvrtković *et al.* 2011) in the west to the Osogovo and Rila mountains of Bulgaria in the east. New localities have been discovered in FYR Macedonia (Verovnik *et al.* 2010, Davkov & Melovski in Franeta & Đurić 2011), Greece (Pamperis 2009) and Serbia (Franeta & Đurić 2011) during recent years.

Material and methods

The expedition consisted of six Danish and one Serbian lepidopterologists. Material was collected using entomological nets inside and in the vicinity of the Durmitor National Park between June 23 and June 28. Photographs of locality and voucher specimens were taken using a Nikon Coolpix L100 and Nikon Coolpix 501, respectively.

Habitat types were identified according to Lakušić (2005a) and Lakušić *et al.* (2005). These habitat types were related to European EUNIS habitat classification (Davies & Moss 2002) using Lakušić (2005b). As one habitat type present in Serbia is not yet included in European classification, beside the European EUNIS name (of a higher level) we wrote the Serbian name which is more precise.



Fig. 1. Habitat of *Colias caucasica balcanica* at Borje, Montenegro. E1.72 *Agrostis - Festuca* grassland in vicinity of G3.4C Southeastern European *Pinus sylvestris* forests. (photo A. Nahirnić).

Results

Montenegro

One of the aims of the expedition was to look for *Colias caucasica balcanica* and *Agriades pyrenaicus dardanus* Freyer, 1845 among other species of Rhopalocera. A survey of the literature showed that the first to mention *Colias caucasica balcanica* from Montenegro was Mary de la B. Nicholl (1902) who determined it like *Colias myrmidone*. Here Nicholl reported to have sighted one *Colias caucasica balcanica* near Obzir. Nicholl writes that it took two long days of marching from Mt. Durmitor across the Brda, to Tara canyon and the Bosnian border. During these two days she observed several specimens of *Colias caucasica*. We were not able to find the locality Brda which corresponds with Nicholl's route so we give here our assumption based on Nicholl (1902) and Thomas (1979) that Nicholl travelled from the western foothills of the Durmitor massif to the Tara canyon over the Pivska planina plateau. Unfortunately Nicholl was not able to catch any *Colias caucasica balcanica* (Nicholl 1902), but these records are considered very reliable, as she collected numerous specimens of this species in June and July 1898 at Trebević and Baba Planina in Bosnia and Herzegovina (Nicholl 1899). Since then there have been no reliable records of *Colias caucasica balcanica* in Montenegro.

Sijarić *et al.* (1984) made a thorough survey of the butterflies from more than 100 localities on Mt. Durmitor, but despite this they have no records of *Colias caucasica balcanica* except Nicholl's. Also Franeta & Đurić (2011) as well as Jakšić and Nahirnić (in 2011 and 2012) have visited Mt. Durmitor several times without finding *Colias caucasica balcanica*. Only Tolman & Lewington (1997) mention the species from Mt. Sinjajevina in Montenegro, a record we have not been able to confirm from the literature.

On June 23 we drove from the town of Žabljak towards the Tara Gorge, making several stops. One of these stops was at Borje, Durmitor Mt. (43°09'29" N, 19°12'34" E, 1297 m). The locality is described as a mosaic of pastures, F3.16 *Juniperus communis* scrub and

G3.4C Southeastern European *Pinus sylvestris* forests; the bedrocks are limestone and dolomite. Here, in pastures, several specimens of an orange *Colias* were collected and in the evening it was verified that we had collected *Colias caucasica*. It turned out that we had collected 3 fresh males of *C. caucasica balcanica*.

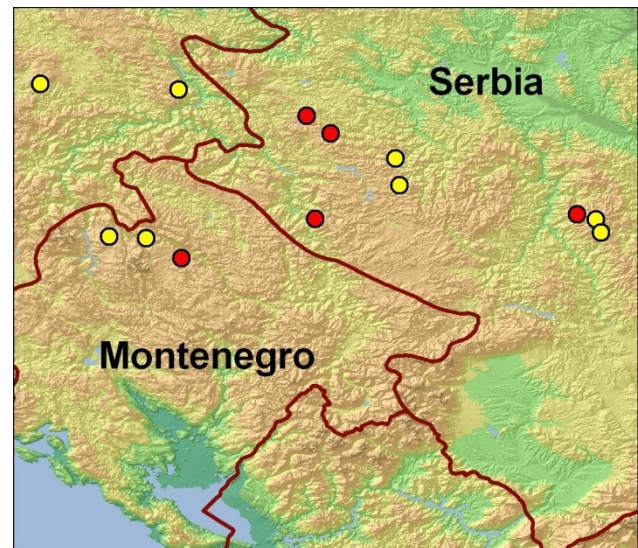


Fig. 2. Distribution of *Colias caucasica balcanica* in Serbia and Montenegro; red dots – new records, yellow dots – published records.

July 24 we spent investigating the localities Žabljak, Crno jezero, Ivan do, Javorje, Suva lokva and the high altitudes of the Sedlo Pass, without any remarkable observations. During the night and the following day the rain poured down continuously. The weather was cloudy with showers for the following 3 days and, even though we revisited the locality, no butterflies were on the wing. On June 28 we revisited the locality in sunshine. This time the area was surveyed more thoroughly during which 7 more males were collected. Borje was visited by Nahirnić several times later and at the July 10 a single male of *C. caucasica* was observed. The habitat is E1.72 *Agrostis - Festuca* grassland in the vicinity of G3.4C Southeastern European *Pinus sylvestris* forests (Fig. 1). Although no preimaginal stages were noticed during these visits we found and determined a possible larval host plant as *Chamaecitysus falcatus* (Waldst. et Kit.) Holub. Historical and our new record for Montenegro are presented on a distributional map (Fig. 2).

Serbia

We are able to publish here the following new records for Serbia:

On June 20th 2013 one male *C. caucasica* was observed by Nahirnić at Mt. Zlatibor, Čigota, Rakovica (western Serbia). GPS coordinates 43°38'34" N, 19°47'13" E, altitude 1249 m. One of the habitats where this specimen was noticed is E2.3 Mountain hay meadows in the vicinity of G1.6C Illyrian [*Fagus*] forests. The bedrock is serpentine. At the same locality Bernd Plössl observed 2 ♀ on July 21st 2013.



Fig. 3. Males of *Colias caucasica balcanica*. Left row specimens collected at Mt. Varous (NV Greece). Middle row specimens collected at Mt. Durmitor, Borje (Montenegro) 23rd June and 28th June 2013. Right row *Colias croceus*, the upper 3 specimens collected at Mt. Durmitor, Borje, (Montenegro) 23rd June and 28th June 2013, the remaining 2 specimens are from Romania and Czech Republic. (photo A. L. Viborg).

On June 22nd 2007 1♂ *C. caucasica* was collected by Dejan Sokolović at Mt. Zlatibor, Zlatibor (western Serbia). GPS coordinates 43°42'42" N, 19°41'44" E, altitude 1005 m. The bedrock is serpentinite.

On July 22nd 2012 2♀ and 1♂ *C. caucasica* were observed by Nahirnić at Mt. Jadovnik, Milošev Do, Prisoje (southwestern Serbia). GPS coordinates 43°18'43" N, 19°43'42" E, altitude 1024 m. Habitats are meadows in the vicinity of G4.6 Mixed [*Abies*] - [*Picea*] - [*Fagus*] woodland which is dominant habitat type in Milošev Do area (Mišić 1983; Matović 1986). The bedrock is limestone.

On July 15th 1988 1♂ and 1♀ were collected by Aleksandar Četković on Mt. Kopaonik, Kukavica (central Serbia). GPS coordinates: 43°19'45" N, 20°44'38" E, altitude 1696 m.

Additionally we can report new findings at two previously published localities.

Mt. Kopaonik, Jaram (central Serbia). GPS coordinates 43°18'35" N, 20°48'57" E, altitude 1750 m. At July 27th 2011 Jakšić observed 3♂ and Nahirnić observed 1♂ *C. caucasica balcanica*. Further at July 23th 2013 Jakšić observed 2♂ and Nahirnić, 1♂ and 1♀. One of the habitats where specimens were usually noticed is F2.23

Southern Palaearctic mountain dwarf [*Juniperus*] scrub (Serbian EUNIS name F2.231 Balkanske subalpijske žbunaste formacije sa dominacijom polegle kleke *Juniperus sibirica* (= *Juniperus nana*)). The bedrock is silicate.

Mt. Kopaonik, Bele stene (central Serbia) 43°15'31" N, 20°50'11" E, altitude 1700 m. On 23th July 2010 Jakšić collected 1♂ *C. caucasica balcanica*. On 11th July 2011 2♂, 2♀ were observed and an additional 3♂ and 2♀ were observed on 14th July 2011. The bedrock is limestone.

Including these new records for Serbia, *C. caucasica balcanica* is at present known from the following mountains: Mt. Kopaonik (Buresh & Tuleschkow 1928-1929; Jakšić 1988; this publication), Mt. Mučanj and Mt. Javor (Franeta & Đurić 2011), Mt. Zlatibor and Mt. Jadovnik (this publication) (Fig. 2).

Discussion

Wing characteristics of males

Based on descriptions in Tolman & Lewington (2008), Tvrtković *et al.* (2011) states: "In *Colias* species characterized by an androconial patch (sex-brand) in males, only two species have a black submarginal band without crossed yellow veins...— the Western Palaearctic Danube clouded yellow, *Colias myrmidone* Esper, 1781 and the Balkan clouded yellow, *Colias caucasica* Staudinger, 1871". Many of the keys we have examined do not mention the presence of yellow veins in the black submarginal band of male *C. caucasica*. Chinery (1998) wrote: "In the male they are crossed by only very faint yellow veins, mainly near the tip". In Nekrutenko (1990) we found a similar description for *C. caucasica caucasica*. As one of the 3 male specimens collected at Borje had yellow veins in the upper part of the black submarginal band, it was first misidentified as a *Colias croceus* (Geoffroy, 1785) (Fig. 3, second row). This led us to study the material collected at Borje more thoroughly and we found that, from a total of 10 males, in 2 males the veins V5 to V9 of the fore-wings were yellow while 1 specimen has the veins V5 and V6 yellow.

We then expanded our investigation to include specimens collected in Greece (Mt. Varnous). A total of 64 males was examined. From these 3 have veins V5 to V9 of the fore-wings yellow, while 12 specimens have the veins V5 and V6 yellow. From Bulgaria (Rila Mts) (NMNHS) 18♂ were examined and here 1 specimen has the veins V5 to V9 of the fore-wings yellow (Fig. 4). Based on this, the above mentioned characteristic can be applied as a general rule, but exceptions are not very rare. Furthermore it seems like the frequency of yellow veins varies between different populations.

When specimens collected at Borje are compared to specimens collected in Greece (Mt. Varnous), the ground-colour of the Montenegrin specimens is clearly a less deep orange. Rebel (1903) states about females of *C. caucasica balcanica*: "Die bulgarischen orange-gelben Stücke sind noch dunkler als die bosnischen." If this observation can be extrapolated to the males as well, it seems to fit our observation. Based on males collected in

Bosnia and Herzegovina, Rebel (1904) writes: "die auf den Hinterflügeln zuweilen einen schwachen violetten Schiller gewinnt". None of the 10 males collected in Montenegro, had this violet reflection on the hindwings. In specimens collected in Greece (Mt. Varnous) this violet reflection is not very rare, as it was observed in 5 of 17 examined male specimens.



Fig. 4. Male *Colias caucasica balcanica* with yellow veins from Rila Mts, Banya Kostenez, (Bulgaria), 1000-1300m, 5th July 1928, P. Drenski leg., wing span 51 mm (photo S. Beshkov).

Protection and conservation

C. caucasica is not a protected species in Montenegro (Anonymous 2006). Based on the available data, it seems like *Colias caucasica balcanica* is extremely localized and rare in Montenegro, and this makes this species of conservational concern. Ideally this should be done by protecting the habitat rather than the species. In the Red data book of Serbian butterflies it is listed as endangered (Jakšić 2003) and it is a strictly protected species (Anonymous 2010). Moreover, it is target species in Prime Butterfly Areas in Serbia (Jakšić 2008).

Protected localities are Rakovica inside of the Nature park "Zlatibor", and Bele stene, Jaram and Kukavica inside the National park "Kopaonik". Localities Zlatibor, Prisoje, Vrela and Borje are near the boundaries of protected areas Nature park "Zlatibor", Special nature reserve "River Mileševka Gorge" and National park "Durmitor", respectively. We suppose that populations from the latter localities may also be distributed inside protected areas. An interesting record is on the locality Zlatibor on the edge of this town because this is one of the biggest touristic complexes in Serbia.

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