

The discovery of *Polyommatus aroaniensis* (BROWN, 1976) in Bosnia and Herzegovina (Lepidoptera: Lycaenidae)

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Abstract: During a field trip to SE Bosnia and Herzegovina in 2011 a small population of *Polyommatus aroaniensis* was discovered south of the town of Gacko. This is the north-westernmost locality for this species, far from its contiguous range in Greece, Bulgaria and southern Macedonia. In subsequent years additional studies provided evidence for an extremely rich butterfly fauna at this locality with a total of 78 species observed. Among those species *Polyommatus thersites* and *P. ripartii* are considered extremely rare in Bosnia and Herzegovina. Successful rearing of *P. aroaniensis* from this locality enabled us to illustrate its lifecycle.

Die Entdeckung von *Polyommatus aroaniensis* (BROWN, 1976) in Bosnien und Herzegovina (Lepidoptera: Lycaenidae)

Zusammenfassung: Während einer Exkursion in den Südosten von Bosnien und Herzegovina im Jahr 2011 wurde südlich der kleinen Stadt Gacko eine kleine Population von *Polyommatus aroaniensis* gefunden. Dies ist der bisher nord-westlichste Nachweis der Art, weit weg vom geschlossenen Hauptverbreitungsgebiet in Griechenland, Bulgarien und dem südlichen Makedonien. In den darauffolgenden Jahren wurden in weiteren Studien vor Ort eine sehr artenreiche Tagfalterfauna mit insgesamt 78 Arten nachgewiesen. Unter diesen werden *Polyommatus thersites* und *P. ripartii* als extrem rare Arten in Bosnien und Herzegovina betrachtet. Eine erfolgreich Zucht von *P. aroaniensis* von diesem Fundort erlaubt die Darstellung des Lebenszyklus der Art.

Introduction

Polyommatus aroaniensis (BROWN, 1976) is one of several “Anomalous blue” butterfly species belonging to the subgenus *Agrodiaetus*. Its close relatives are commonly referred to as “brown” *Agrodiaetus* due to the uniform brown colouring of male upperside forewings. Phylogenetically, however, they belong to the group of *Polyommatus menalcas* (FREYER, 1837) (*sensu* WIEMERS 2003) in which some representatives have males with blue or whitish colouration. Based solely on external characteristics, the majority of species in this group are hard to identify, and taxonomic status is usually determined through karyology. In Europe the determination of many of the taxa from this group is based on variations in chromosome numbers (e.g. COUTSIS et al. 1999, COUTSIS & DE PRINS 2005, KOLEV 2005). In recent years more sophisticated molecular methods have been used to resolve the relationships of the *Agrodiaetus* subgenus, but several newly described taxa from the Balkans have not been included (WIEMERS 2003, KANDUL et al. 2004, LUKHTANOV et al. 2006). This has inevitably led to confusion in this region regarding the distribution and identification of many species of the “brown” *Agrodiaetus*.

Within this group of taxa *P. aroaniensis* can typically be distinguished from other brown Balkan *Agrodiaetus* species by the lack of a white streak on the underside of its hindwing. However, in some specimens, particularly females, the white streak was visible, but invariably vestigial.

An overview of the distribution of *P. aroaniensis* was given by KOLEV & VAN DER POORTEN (1997). The species has been recorded in many parts of Greece (PAMPERIS 2009), from a few areas in southern Macedonia (KOLEV & VAN DER POORTEN 1997, MELOVSKI & BOZHINOVSKA 2014) and in some localities in south-western Bulgaria, including one isolated occurrence in the central part of the country (ABADJIEV 2001, KOLEV & VAN DER POORTEN 1997). TSHIKOLOVETS (2011) shows its distribution extending into south-western Albania, although the species was not recorded from this country in recent surveys (VEROVNIK & POPOVIĆ 2013) and confirmation is needed.

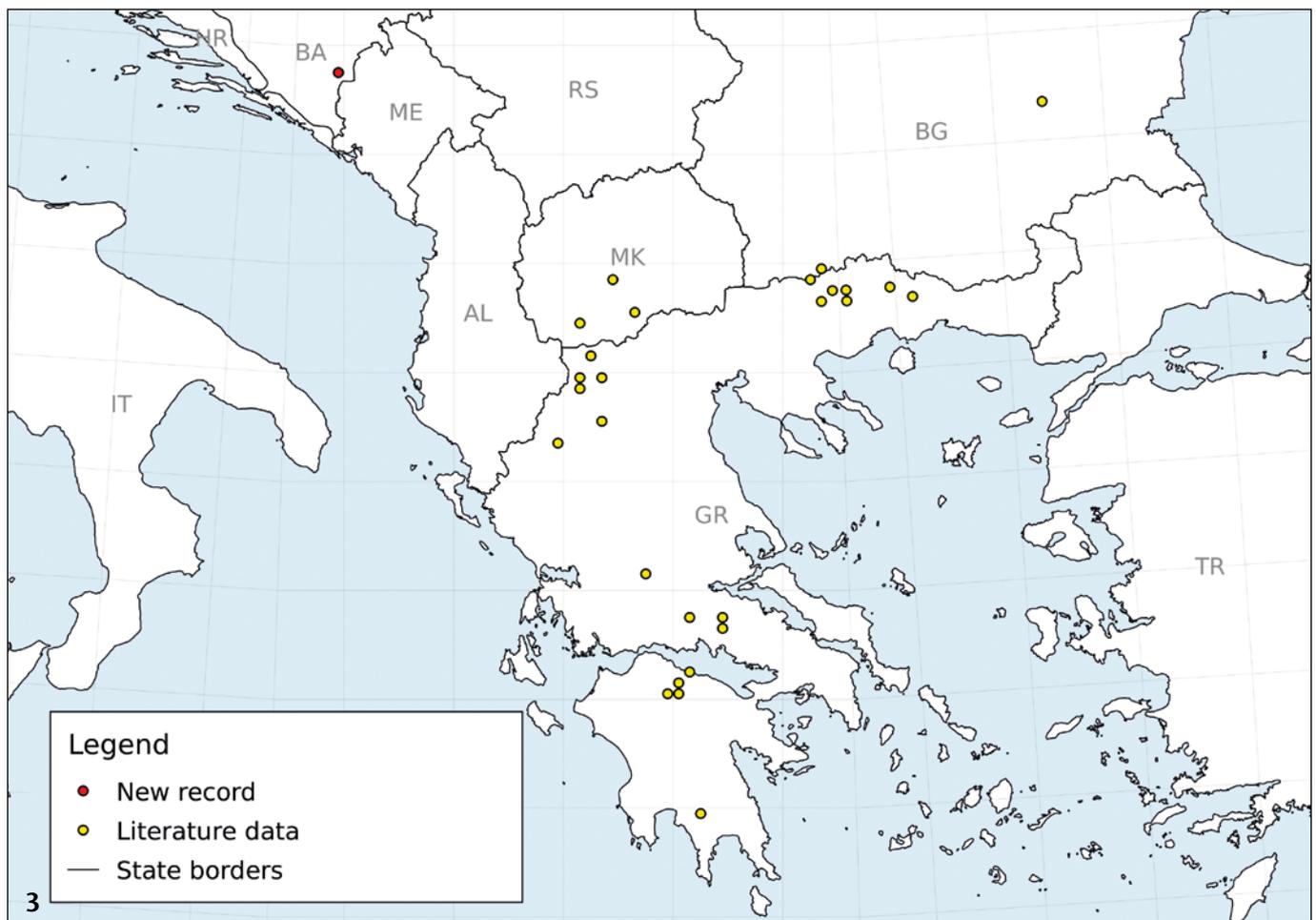
Results and discussion

P. aroaniensis was unexpectedly recorded during our field surveys in 2011 in a small valley south of Gacko, a town in the south-eastern part of Bosnia and Herzegovina (Fig. 1, 2). This record extends the known distribution of *P. aroaniensis* northwards, and represents an isolated occurrence far from its known range (Fig. 3). It is interesting to note that this part of Herzegovina is also recognised for the isolated occurrence of a further two, mainly southern or eastern, Balkan species; *Pseudochazara anthelea* (HÜBNER, 1825) and *Zerynthia cerisy* (GODART, 1824), both with limited distribution in this area (SCHAWERDA 1909, SIJARIĆ 1989).

During our first visit on 27. vi. 2011 only three fresh males of *P. aroaniensis* were observed. The habitat is, predominantly, extensive pastureland where traditional grazing regimes are still practised, sustaining short calcareous grassland vegetation, ideal for the survival of this species. The area is also characterised by limestone rocky outcrops and sparsely vegetated scree. Its potential larval host plant, an unidentified *Onobrychis* sp., was found in more sheltered situations, predominantly near rocks, bushes and along streams. On the occasion of our second visit on 19. vii. 2013 both sexes were common (Fig. 4). In addition, several specimens of a closely related species, *P. ripartii* (FREYER, 1830), with well-defined white stripe on their hindwing underside, were also present at this locality. Two further suspected specimens of *A. ripartii*, a male and a female displaying



Fig. 1: Calcareous pastures in a valley south of Gacko in south-eastern part of Bosnia and Herzegovina. **Fig. 2:** The habitat of *Polyommatus aroaniensis* in Bosnia and Herzegovina with an abundance of *Onobrychis* plants, the host plant of *P. aroaniensis*, situated in sheltered terrain, close to rocks and trees. **Fig. 3:** Tentative distribution map of the distribution of *A. aroaniensis* in Europe based on published data (KOLEV & VAN DER POORTEN 1997, MELOVSKI & BOZHINOVSKA 2014, ABADJIEV 2001) shown on an UTM 34N map. The grid lines divide 100 × 100 km UTM zones, while the points are given in 10 × 10 km resolution. Yellow points represent confirmed records from literature data and a single red point denotes our recent observation in Bosnia and Herzegovina. **Fig. 4:** Male uns. of *Polyommatus aroaniensis*, 19. vii. 2013, south of Gacko, Bosnia and Herzegovina. **Figs. 5–6:** Female ups. & uns. of *Polyommatus aroaniensis*, ab ova, emerged 25. xii. 2014, south of Gacko, Bosnia and Herzegovina. **Fig. 7:** Ovum, 26. vii. 2014. **Fig. 8:** L₁ larva feeding on *Onobrychis vicifolia*, 7. x. 2014. **Fig. 9:** L₃ fully mature larva, 31. x. 2014. **Fig. 10:** Pre-pupal larva, 4. xi. 2014. **Fig. 11:** Newly formed pupa, 8. xi. 2014. **Fig. 12:** Pupa, 7. xi. 2014. — Figs. 1, 4: M. POPOVIĆ; Fig. 2: R. VEROVNIK; Figs. 5–12: M. GASCOIGNE-PEES.



undersides hindwing with white streaking, were observed and collected for identification on 17. vii. 2014.

On both visits the area was teeming with butterflies, and, to date, 78 butterfly species have been recorded from this exceptionally rich locality. According to the overview of the butterfly fauna of Bosnia and Herzegovina by LELO (2008) the following species, which have been observed at the site at Gacko, are considered local or rare: *Leptotes pirithous* (LINNAEUS, 1767), *Cupido osiris* (MEIGEN, 1829), *Aricia anteros* (FREYER, 1838), *Polyommatus escheri* (HÜBNER, 1823), *P. thersites* (CANTENER, 1835), *P. ripartii* and *Hyponephele lupina* (COSTA, 1836). Prior to our surveys in this area *P. thersites* was only known from a few localities in Bosnia and Herzegovina around Sarajevo (SIJARIĆ 1991, LELO & VESNIĆ 2010), while *P. ripartii* had only been recorded once, north of Mostar (SIJARIĆ 1971). It is likely that both these species are more widespread in the southern part of the country, and additional localities could be discovered during future surveys.

Two females of *P. aroaniensis* from the site south of Gacko were collected by Martin GASCOIGNE-PEES for ovipositing on 17. vii. 2014 (Figs. 5, 6). They were initially kept in cardboard pill boxes prior to their transferal to the U.K. on 21. vii. On arrival they were relocated to a netted pot containing dried up stems, including seed heads, of *Onobrychis viciifolia* along with fresh cut flowers, a nectar source for the females. The netted cage was placed in a warm, sunny position inside a conser-

vatory, and moistened pads, regularly re- quenched with water, were placed on the roof of the cage to provide shade and an additional nectar source. After a settling in period, many eggs were laid on the stems of these dried up cuttings, predominantly on seeds or in the axils of bracts (Fig. 7). The ova were collected and placed in a plastic box and left in a cool, dark situation inside garage. The eggs were inspected each day and by 18. ix. the first ova had hatched, 55 days after the initial eggs had been laid (Fig. 8). From this date onwards a continuous and prolonged hatching ensued carrying through into October and November.

Under laboratory conditions the larvae developed rapidly, but at different rates, nourishing on the leaves of *Onobrychis viciifolia*, and by 31. x. several larvae had reached their final (5th) instar (Fig. 9).

The only visible variation in larval morphology was in the final instar. At this stage some larvae developed pinkish edges to their wide white spiracular bands; these bands were observed to be very faint or absent in other specimens. By 4. xi., prior to pupation, the first fully mature larva had turned a uniform green colour exhibiting a typical pre-pupal posture (Fig. 10), subsequently pupating on 7. xi. Prior to hardening, the pupa is pale green in colour (Fig. 11) becoming darker once it has matured, with a pale olive green head capsule and wing sheaths and a yellow ochre abdomen (Fig. 12).

The first butterfly, a male, emerged on 2. XII. 2014 and, in all, ten specimens hatched from pupae. They varied in size but there was no significant difference in their markings apart from a minimal variation in the size of their underside ocelli. Their undersides, characteristically a uniform buff-brown colour, showed no indication of a white strike.

The discovery of *P. aroaniensis* in Bosnia and Herzegovina creates a large gap in its known distribution, and, based on additional surveys in Montenegro and Albania, new localities could potentially be discovered to fill this void. Additional localities could also be found in Herzegovina and neighbouring Dalmatia where *P. ripartii* was recently recorded for the first time (DINCA et al. 2013, KOREN 2010, KOREN & LAUŠ 2013). We hope this discovery will motivate further lepidopterists to explore this fascinating and understudied part of Europe.

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