



Contributions to The Morphology of *Polyommatus (Agrodiaetus) Alibalii* Carbonell, 2015 (Lepidoptera, Lycaenidae) Living Kahramanmaraş, Region, Turkey

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ABSTRACT

Polyommatus (Agrodiaetus) alibalii is a new butterfly species which was described by Frederic Carbonell in 2015. In the Carbonell's article, since the descriptive information about the species is limited, a further redescription study has been aimed for more detailed identification the species. This study was conducted in two stages with the field works in Kırksu Highland in Geben village of Andırın district of Kahramanmaraş province in Turkey in July and August in 2016 and 2017, and then laboratory works in the Zoology Laboratory at Mustafa Kemal University in Hatay, Turkey. In the field, behaviors of the adults have been observed and recorded in their habitats, and eight male and five female specimens of the species were collected for laboratory works. In this paper, the external morphology and genital structure of the male and female of the species were described in detail. In addition to *P. alibalii*, the male genital preparations of the species of *P. theresiae* (Schurian et al., 1992), *P. iphigenia* (Herrich-Schaffer, 1847), *P. wagneri* (Forster, 1956) and *P. eurypilos* (Gerhard, 1851) were prepared.

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Türkiye, Kahramanmaraş Bölgesinde Yaşayan *Polyommatus (Agrodiaetus) alibalii* Carbonell, 2015 (Lepidoptera, Lycaenidae) Morfolojisine Katkıları

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ÖZET

Polyommatus (Agrodiaetus) alibalii, Frederic Carbonell tarafından 2015 yılında tanımlanan yeni bir kelebek türüdür. Carbonell'in makalesinde, tür hakkındaki tanımlayıcı morfolojik bilgilerin sınırlı olması sebebiyle türün daha ayrıntılı tanımlanması gerekliliği ortaya çıkmıştır. Bu çalışma kapsamında, 2016-2017 yılları Temmuz-Ağustos aylarında Kahramanmaraş ili Andırın ilçesi Geben köyü Kırksu yaylasından toplanan ergin (8♂ ve 5♀) örnekler Mustafa Kemal Üniversitesi zooloji laboratuvarına getirilerek dış morfolojileri ve genital yapıları ayrıntılı olarak incelenmiştir. Tanımlamalar türün orjinal tanımı kuralına uygun olarak yapılmıştır. *Polyommatus (Agrodiaetus) alibalii*'ye ek olarak *P. theresiae* (Schurian et al., 1992), *P. iphigenia* (Herrich-Schaffer, 1847), *P. wagneri* (Forster, 1956) ve *P. eurypilos* (Gerhard, 1851) türlerinin erkek genital preparatları da bu çalışmada verilmiştir.

Introduction

In the literature, there are several studies on taxonomical and molecular identification of the species from the subgenus *Agrodiaetus* Hübner, [1822] and the genus *Polyommatus* Latreille, 1804 (Lukhtanov et al., 1998; Lukhtanov and Dantchenko, 2002; Lukhtanov et al., 2003; Kandul et al., 2004; Tlavera et al., 2013; Shapoval and Lukhtanov, 2015). According to Lukhtanov and Dantchenko (2002), the genus *Agrodiaetus* Hübner, [1822] is one of the most complicated groups of the Palearctic Lepidoptera. It includes numerous species, subspecies and forms with uncertain taxonomic status. Most of these taxa show little differentiation in colour and wing pattern. The genitalia of the species exhibit similar structures. In view of strong intrapopulation polymorphism, in certain cases, it is virtually impossible to separate sympatric species. The assignment of allopatric forms is an even more complicated problem because data on the real population structure of the species are very limited, and the geographical variability of the standard morphological characters is not always correlated. In general, such forms can be interpreted either as individual species with limited distribution or as local populations of the widely distributed species. This problem is still under discussion.

Despite current progress in morphological and molecular studies of ‘Blue’ butterflies, subfamily Polyommatinae their higher-level systematics remain controversial (Talavera et al., 2013). According to Talavera et al. (2013) was divided this subfamily into four tribes: Lycaenesthini, Candalidini, Niphandini and Polyommatini. Among these tribes, the Polyommatini is the most diverse and arguably one of the most systematically difficult groups of butterflies. *Polyommatus* Latreille, 1804, section is the most species-rich group within the blue butterflies, including about 460 species. It is generally cosmopolitan, but with most genera and species restricted to the Palearctic, Neotropical and Nearctic regions. Of a total of ca. 340-350 Palearctic species, ca. 130 belong to the monophyletic *Agrodiaetus*.

When compared to European countries with a total of 90 Lycaenidae species, Turkey is richer in Lycaenidae biodiversity with its 130 Lycaenidae species. (Atay and Ogur, 2011). Koçak and Kemal (2006, 2007, 2009) reported a higher number of butterfly species as 405 from nine families of Rhopalocera in their faunistic studies in several years. The authors have listed a total of 99 species from the genus *Polyommatus* and 56 species of the subgenus *Agrodiaetus* in Turkey. They reported a total of 187 species of butterflies for the province Kahramanmaraş. Of these species, 72 was belong the *Lycaenidae* family and 16 belong to the subgenus *Agrodiaetus*.

As understood from the figures above, Kahramanmaraş is one of the biodiversity rich regions in terms of butterfly species with its some endemic species. In the province, *Polyommatus (Agrodiaetus) alibalii* is one of the endemic species described recently. With his study entitled “Un nouvel *Agrodiaetus* de Turquie (Lepidoptera, Lycaenidae)” in the “Bulletin de la Societe entomologique de France” Carbonell (2015), Frederic Carbonell described *Polyommatus (Agrodiaetus) alibalii*

Carbonell, 2015 as a new species from *Lycaenidae* family. In this study of two pages, Carbonell defined the colors of forewings and hindwings and the wingspan measured from 9 male and 5 female specimens collected in the habitat of the species. Additionally, for comparison purposes, he also presented the wing upper- and under-side photographs of the species with some similar *Agrodiaetus* species such as *Polyommatus (Agrodiaetus) lycius* (Carbonell, 1996) and *Polyommatus (Agrodiaetus) larseni* (Carbonell, 1994).

Since it is a recently described species, the descriptive data about *P. alibalii* is limited with the Carbonell’s mentioned study. For this reason, we aimed to contribute to the identification of the species with a more detailed redescription work on genital organ structure and ecological information. In this study, the coloring, shape and patterns of the upper- and under-side of wings and the genital morphology of male and female of the species *Polyommatus (Agrodiaetus) alibalii* were described. The male genital morphology of the species was introduced for the first time, and compared to those of *P. theresiae* (Schurian et al., 1992), *P. iphigenia* (Herrich-Schaffer, 1847), *P. wagneri* (Forster, 1956) and *P. eurypilos* (Gerhard, 1851) which are the other common *Agrodiaetus* species in the area.

Material and methods

Field Studies

Field studies was carried out in the localities of different altitudes and vegetation covers in the Kirksu Higland in Geben village of Adırm district of Kahramanmaraş province in two different days (on Saturday and Sunday) between middle of July to the end of August in 2016 and 2017. All the field studies were done during suitable weather conditions (without precipitation and strong winds) from early in the morning to sunset.

In the field studies, butterflies were observed and photographed with a DSLR camera with various lenses. The visited plants by the butterflies were photographed and collected. The behaviours of the butterflies such as feeding, perching and laying eggs were recorded and photographed in their habitats. For the collecting the specimens, 45 cm wide and 75 cm deep insect net was used.

The butterfly specimens caught with insect net were transferred into 10x5x5 cm killing jars and placed in separate petri boxes. A total 8234 male and 5 female specimens (3 male and 1 female in 2016, and 5 male and 4 female in 2017) were collected to use in morphological and genital organ investigations in the laboratory works.

Laboratory Works

Before they lost their body water, the collected specimens were sorted for their body sizes and needlened with the number 1 or 2 insect needles fitting their sizes on special stretching boards, and forewing and hindwing pairs were stretched in the laboratory works. For the drying of the stretched specimens, they were kept at room temperature for two weeks in a dark and dry place. Male

and female genital organs were prepared for the identification of the species following morphological examinations and measurements on the female and male specimens. The needling of the butterflies, stretching of the wings and genital organ preparations were done accordingly the methods defined in Atay (2006).

More than 30 species of *Agrodiaetus* are almost similar to each other in appearance due to their genetic similarities. Therefore, in field observation studies, it is almost impossible to make definite identifications of the species of this group (Baytaş, 2008). For precise identification of *Agrodiaetus* species, the examination of genital organ preparations of male specimens has an important place in identifying the species in laboratory works. For this aim, the collected specimens were identified based on genital organ examinations by the first author in the Zoology Laboratory in Faculty of Science and Letter at Mustafa Kemal University in Antakya, Turkey.

Results and Discussions

Polyommatus (Agrodiaetus) alibalii Carbonell, 2015

Material Examined by Carbonell

Holotype: ♂, Turquie, region N d'Andırın, 1650 m, prov. Kahramanmaraş, 31.VII.2015, *Bali leg.*, in Museum national d'Histoire naturelle (MNHN), Paris, France.

Allotype: ♀, *idem* holotype, 14.VIII.2015 (MNHN).

Paratype: (8 ♂ et 4 ♀), 4 ♂, *idem* holotype (coll. Bali); 1 ♀, *idem* allotype (coll. Bali); 4 ♂ et 3 ♀, *idem* allotype (coll. Carbonell).

Material Examined by us

1♂, 1♀ Turkey, Kahramanmaraş, Andırın, Geben, Kırksu, 25.vii.2017, Geben-Kırksu 8 km, 37°46'27" N; 36°21'36" E, 1503 m., 7♂, 4♀ Turkey, Kahramanmaraş, Andırın, Geben, Kırksu, 14.viii.2016; 25.vii.2017, Geben-Kırksu 8 km, 37°46'27" N; 36°21'36" E, 1503 m, (coll. Atay).

Redescription

Wingspan 31-35 mm (32.6 mm); forewing 15.5-16.5 mm (15.8 mm); body length 12.5-14.5 mm (13.3 mm); antennae length 8.2-9.0 mm (8.6 mm).



Figure 1 The view of the head of a male specimen of *P. alibalii*.



Figure 2 Mounted male and female specimens *P. alibalii*.

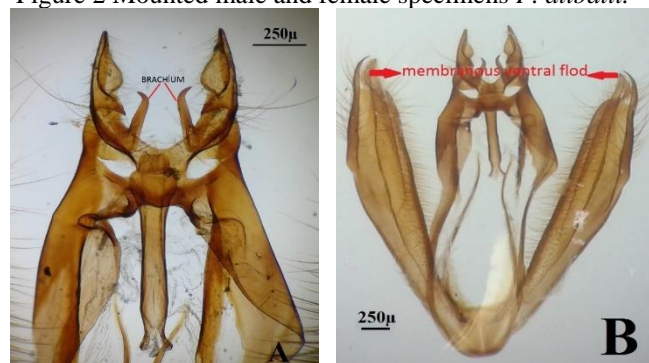


Figure 3 The view of the male genitalia of *P. alibalii*.

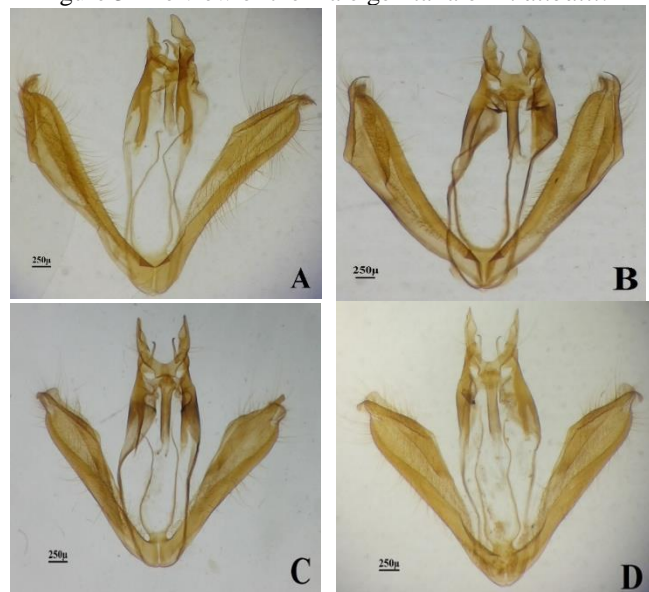


Figure 4 The view of the male genitalia of *P. theresiae* (A), *P. Iphigenia* (B), *P. wagneri* (C) *P. eurypilos* (D).

♂ *Wings*: The upperside ground colour of both wings is pale blue with light metallic tint throughout costa. This darkness is better in the front wings. Submarginal and marginal (outer part) dusted with black scales. The veins in this region are strong darkened distally. Discoidal, submarginal and antemarginal spots absent. Inner part of fringes blackish gray and outer part is grayish white. Black border line is thin on both wings. The underside ground colour of both wings is gray, but hindwings with light brownish tint. Bluish basal suffusion is clearly prominent, but strong. Discoidal black spot on the forewings well developed, on the hindwings almost invisible.

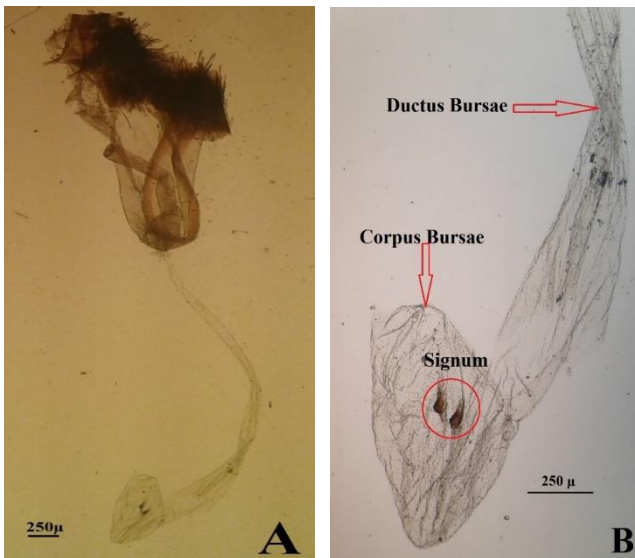


Figure 5 The view of the female genitalia of *P. alibalii*.



Figure 6 Location of the habitat of *P. alibalii* in Turkey



Figure 7 A satellite view of Kirksu Highland



Figure 8 A part of the habitat of *P. alibalii*.

Head: Frons, labial palpus and around the eyes covered with white smooth scales. Eyes dark brown and densely short hairy; eye height 1.42 times its width. Labial palpus well developed and directed obliquely upwards. The last segment of the labial palpus is covered with short black scales. Head 1.36 times wider than its length. Antennae length 8.64 mm, and its length 0.54 times longer than forewing length (Fig. 1).

Postdiscal black spots of the forewings relatively large, but on the hindwings very small. All spots on both wings encircled with dirty white. Submarginal and marginal spots on both wings clearly visible, but more prominent on the hindwings. White streak on the hindwings well developed and clearly visible, but it is not enlarged distally (Fig. 2)

♀ **Wings:** The upperside ground colour of both wings is dark brown. Discoidal black spot slightly visible on forewings. Marginal orange spots on the hindwings visible, but more prominent anal margin. The underside ground colour of both wings is grayish light brown, but hindwings are darker. Discoidal spots and postdiscal spots on the forewings are relatively larger than the male. Discoidal spot, postdiscal spots, submarginal spots, marginal spots and White streak on hindwings are similar to male.

Male Genitalia: Aedeagus is short, thick and in the form of a cylindrical rod; the middle part is more acute, the front and rear ends are wider; its length is 4.66 times its width (Fig. 3). Valva is long, and its length is 5.50 times its width; the outer edge is convex in the middle; this edge is folded on itself between the middle region and the tip. This structure shape like a strong twist on the end of the valva. Inner part of valva with membranous ventral fold and quite long and wide. The inside edge of the valve is quite flat. There are sparse, long and hard hairs in the inner edge and near the tip of the outer edge of valva. Uncus is forked and U shaped; each fork arm is strongly expanded in the middle and tapered at the end. On uncus there are long and short sparse hairs. Just below the uncus, there is a pair of brachium in the shape of a hook, and strongly curled and uncurved, and pointed towards the tip. Unlike species *P. theresiae*, *P. iphigenia*, *P. wagneri*, *P. eurypilo*, this structure is shorter and thicker. Tegumen is short and broad. Vinculum and saccus are thin and in the structure of chitin (Fig. 4).

Female Genitalia: Papilla analis rather broad and covered with intense short hairs. Anterior apophysis rather thick and long. Posterior apophysis short and thin. Ductus bursae membranous, narrow and very long. Corpus bursae membranous, small and bag-shaped with small two signums (Fig. 5).

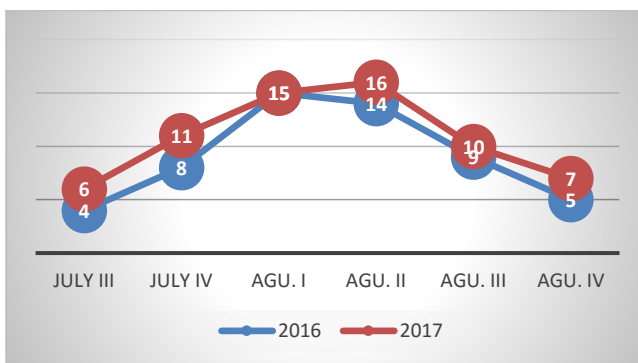
Conclusion

The only habitat of this species is a wide plateau having rich spring water resources and streams in a valley in the altitude of 1400-1500 m in Kirksu Highland (37°46'27" N; 36°21'36" E, 1503 m) in Geben village of Andırın district of Kahramanmaraş province in Turkey (Figs. 6, 7). The highland located in 8 km NE of Geben village is used as the highland settlement area by the local people from June to August in the summer. While the area is primarily covered by *Pinus nigra* vegetation, there

is also a mixed coniferous vegetation consists of *Cedrus libani*, *Juniperus oxycedrus*, *Abies cilicica*, *Fagus orientalis* and *Buxus semperviens* in the higher altitudes of the highland Kırksu (Fig. 8). The species lives in the stony and shrubby fields in the forest clearings and road sides in the area. It was observed that male and female specimens of the species mainly feed on flower of *Teucrium polium* (L.) ve *Centaurea aggregata* (Fig. 9).



Figure 9 Male and Female individuals during feeding on *Centaurea aggregata* (left) and *Teucrium polium* (right) which are the larval host plants of the species



Graphic 1 Number of adult male counted in the field studies in 2016 and 2017

The species is endemic to Andırın in Turkey. According to the Red List of IUCN (International Union for Conservation of Nature and Natural Resources), the status of this species can be regarded as NT (Near Threatened). For this evaluation, we counted the male specimens in flight during morning (hours 08-12) in our two days (on Saturday and Sunday) field observations in 2016 and 2017. Totally 55 and 65 male specimens were counted in these observation studies in 2016 and 2017, respectively (Graphic 1). The counts of the specimens were evaluated as very low when compared to the large surface of the habitat area. Because the flight season of *P. alibalii* is also seasonal highland tourism time for the local people, the habitat is under negative pressure of intensive grazing of large and small ruminants raised by the local people. As the second threatening factor, the stub and picnic fires cause to intensive fogs in daytimes by the roadsides and forest clearings in where the habitat of species located, especially at weekends in the summer months.

Etymology

Frederic Carbonell gave the name of Ali Bali, who sent butterfly specimens to the new species.

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