

Butterflies of Albania – Fluturat e Shqipërisë. New surveys, new species and a new checklist (Lepidoptera: Papilionoidea)

Sylvain Cuvelier, Laurian Parmentier, Anila Papparisto & Jurgen Couckuyt

Abstract. Three new butterfly species were recorded for Albania during two recent surveys: *Pyrgus andromedae* (Wallengren, 1853), *Colias caucasica* (Staudinger, 1871) and *Leptidea juvernica* Williams, 1946. Also *Boloria titania* (Esper, 1793) is new for the current Albanian territory that had previously been described by Rebel from the historical, larger Albania but situated now in Kosovo. Two data deficient species from the last checklist are confirmed: *Carterocephalus palaemon* (Pallas, 1771) and *Hipparchia semele* (Linnaeus, 1758). The status of six species is changed from present to data deficient or potential presence because of lacking recent evidence: *Pontia chloridice* (Hübner, 1813), *Satyrium pruni* (Linnaeus, 1758), *Neptis rivularis* (Scopoli, 1763), *Euphydryas maturna* (Linnaeus, 1758), *Coenonympha glycerion* (Borkhausen, 1788) and *Kirinia climene* (Esper, 1783). The geographical distribution for *Pseudochazara tisiphone* Brown, 1980 is significantly expanded to central Albania. Dot distribution maps are provided for all Albanian butterfly species. In addition to the new data, the available literature is screened, resulting in a mandatory update of the checklist for the Albanian butterflies: 196 species with recent evidence, 4 are data deficient and at least 9 have the potential to be discovered with future surveys.

Përmbledhje. 3 lloje të reja fluturash për Shqipërinë janë përcaktuar nga analiza e materialeve të koleksionuara gjatë dy hetimeve shkencore të realizuara së fundmi: *Pyrgus andromedae* (Wallengren, 1853), *Colias caucasica* (Staudinger, 1871) dhe *Leptidea juvernica* Williams, 1946. Gjithashtu edhe *Boloria titania* (Esper, 1793) është tashmë një lloj i ri për territorin e Shqipërisë pasi më parë ky lloj është raportuar nga Rebel në zonën që sot ndodhet në Republikën e Kosovës. Dy lloje të pakonfirmuara në listën e fundit të paraqitur për fluturat e Shqipërisë: *Carterocephalus palaemon* (Pallas, 1771) dhe *Hipparchia semele* (Linnaeus, 1758), konfirmohen nga ky studim. Statusi i 6 llojeve të klasifikuara më parë si lloje të mundshme për territorin e Shqipërisë ose si lloje me të dhëna jo të plota (*Pontia chloridice* (Hübner, 1813), *Satyrium pruni* (Linnaeus, 1758), *Neptis rivularis* (Scopoli, 1763), *Euphydryas maturna* (Linnaeus, 1758), *Coenonympha glycerion* (Borkhausen, 1788) dhe *Kirinia climene* (Esper, 1783)) bazuar në të dhënat e këtij studimi tashmë ka ndryshuar. Zona e përhapjes së *Pseudochazara tisiphone* Brown, 1980, është shtrirë në mënyrë të dukshme edhe në Shqipërinë e mesme. Në këtë punim paraqiten hartat e shpërndarjes të të gjitha llojeve të fluturave të Shqipërisë. Bashkangjitur të dhënave të reja të këtij studimi është paraqitur dhe një analizë e hollësishme e të dhënave të literaturës, që jep si produkt listën e përditësuar të të gjithë fluturave të Shqipërisë. Bazuar në të dhënat e këtij studimi të kryer së fundmi, 196 lloje fluturash referohen për territorin e Shqipërisë, 4 lloje kanë mungesë të dhënash dhe të paktën 9 lloje kanë mundësi të gjenden në studime të ardhshme.

Samenvatting. Gedurende twee recente onderzoeken werden drie soorten dagvlinders ontdekt die nieuw zijn voor Albanië: *Pyrgus andromedae* (Wallengren, 1853), *Colias caucasica* (Staudinger, 1871) en *Leptidea juvernica* Williams, 1946. Ook *Boloria titania* (Esper, 1793) is nieuw voor het huidige Albanese grondgebied maar werd eerder beschreven uit het voormalige, grotere Albanië dat nu deel uitmaakt van Kosovo. Twee data deficiënte soorten van de laatste checklist worden bevestigd: *Carterocephalus palaemon* (Pallas, 1771) en *Hipparchia semele* (Linnaeus, 1758). Door het ontbreken van recente evidentie wordt de status van zes soorten veranderd tot data deficiënt of potentieel aanwezig: *Pontia chloridice* (Hübner, 1813), *Satyrium pruni* (Linnaeus, 1758), *Neptis rivularis* (Scopoli, 1763), *Euphydryas maturna* (Linnaeus, 1758), *Coenonympha glycerion* (Borkhausen, 1788) en *Kirinia climene* (Esper, 1783). De geografische verspreiding van *Pseudochazara tisiphone* Brown, 1980 wordt significant uitgebreid tot centraal Albanië. Er zijn punt-verspreidingskaarten voorzien voor alle Albanese dagvlindersoorten. Naast de nieuwe gegevens wordt de beschikbare literatuur gescreend wat resulteert in een noodzakelijke update van de checklist voor de Albanese dagvlinders. 196 soorten met recent bewijsmateriaal worden in de nieuwe checklist opgenomen, 4 soorten zijn data deficiënt en ten minste 9 andere taxa kunnen bij toekomstig onderzoek worden gevonden.

Key words: Papilionoidea – butterflies – *Pyrgus andromedae* – *Pyrgus alveus* – *Carterocephalus palaemon* – *Colias caucasica* – *Leptidea juvernica* – *Boloria titania* – *Hipparchia semele* – *Pseudochazara tisiphone* – Albania – faunistics – checklist – taxonomy.

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We dedicate this publication to the life's work and butterfly research of Prof. Kastriot Misja (Fig. 1a) done under difficult circumstances in a completely isolated Albania.

Introduction

Albania (Fig. 1b) is a Mediterranean country of the Balkan Peninsula in southern Europe. Albania is one of the European countries with a rich biodiversity heritage

(Zeneli *et al.* 2014), having borders with Kosovo, Montenegro, the Republic of Macedonia and Greece. It covers an area of 28,748 km². The Albanian coastline is 476 km long and the Adriatic and Ionian Seas have a great impact on the climate, flora and fauna of the country. From the fertile coastal plain near the Adriatic Sea, the Albanian land rises into hills and mountains to the North (Albanian Alps) and East (Korabi Mountain). Most of the country is mountainous but the altitude declines from East to West and this strongly influences the conditions of

the climate, land and vegetation. The highest peak is 2,751 m above sea level (Korabi Mountain) and the lowest locality is 8 m below sea level (the former Terbufi Marsh). The average altitude of the country is 708 m above sea level. The climate of Albania is diverse. It has four major climatic zones and 13 sub-zones, which contribute to the country's rich biological diversity. The climatic type of Albania is Mediterranean subtropical with average annual temperatures up to 17.6°C in the South. Precipitation ranges between maximum \pm 2,500 mm in the North (Albanian Alps) and minimum \pm 750 mm in the South (Korçë district), with an average of about \pm 1,430 mm.

Although being a small country, Albania is distinguished for its rich biological and landscape diversity. This diversity is attributable to the country's geographic position as well as geological, hydrological, climatic, soil and relief factors. The mountainous terrain combined with steep cliffs creates ideal conditions for maintaining and protecting a large number of ancestral species which are both endemic and sub-endemic.

The high diversity of ecosystems and habitats (marine and coastal ecosystems, wetlands, river deltas, sand dunes, lakes, rivers, Mediterranean shrubs, broadleaf, conifers and mixed forests, alpine and subalpine pastures and meadows and high mountain ecosystems offers a large variety of plants and animals. In Albania, there are around 3,976 taxa of vascular plants and 756 species of vertebrates. Approximately 30% of the European flora occurs in Albania. There are 32 endemic taxa and 160 near endemic species of vascular plants which have a special protection importance for the country.

The high Albanian forests maintain communities of large mammals such as wolf, bear, lynx, and wild goat and

also characteristic bird communities, which are associated with virgin forests. Coastal lagoons and large lakes inside the country are important areas, especially for wintering migratory birds. Annually, 70 waterfowl and water-bird species are met in Albania with a total population of 180,000 individuals during the winter. Albania is also an important crossroads for the migration of birds, bats, and insects.

There are some 91 globally threatened species found in Albania. These include the Dalmatian Pelican (*Pelecanus crispus*), Pygmy Cormorant (*Phalacrocorax pygmeus*), and the Sturgeon (*Acipenser sturio*) for which Albania is a country of particularly critical importance. Based on the data of the Red Book of Albanian Fauna (Misja 2006) there are 224 species of invertebrates in the Albanian red list, between them there are 61 mollusks and 146 arthropods of which there are 125 species of insects and 91 of them are member of the order Lepidoptera.

In spite of the fact that a low number of species became extinct during the past century in Albania, the loss rate of its biodiversity during the last 50–60 years is believed to have been increasingly high. Moreover, insufficient knowledge and studies of a wide range of flora and fauna limit an accurate historical evaluation of the possible loss of biodiversity within Albania.

Two species of plants and four species of mammals have become extinct and meanwhile 17 bird species no longer nest in the country's territory. During the last 25 years, approximately 122 species of vertebrates (27 mammals, 89 birds, and 6 fish) and four species of plants are considered to have lost more than 50% of their populations.

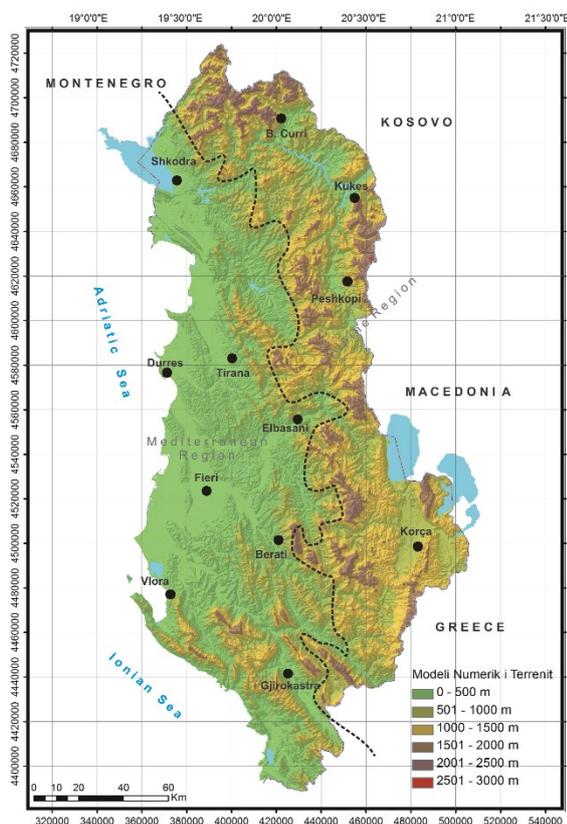


Fig. 1a. Prof. Dr. Kastriot Misja, entomologist, born in Elbasan, Albania, 1933 (© AP).

Fig. 1b. Topographic map of Albania, dotted line: average altitude, 708 m.a.s.l. (© AP).

The number of rare and endangered species of plants and animals is high and expected to increase if appropriate conservation measures are not taken.

It is clear that the Lepidoptera have not been studied as they have been in many other European countries. This insufficient knowledge in part resulted from linguistic differences making access to some important, local publications difficult e.g. Misja (2005).

In van Swaay & Warren (1999) the data quality for Albania was quoted by Prof. Kastriot Misja (Museum of Natural Sciences, Tiranë, Albania) as moderate for the estimation of the distribution and as poor for the estimation of trend. These facts concerning the Albanian butterfly diversity and distribution are also highlighted by the low number of publications over more than a century (Rebel 1913, 1917, Rebel & Zerny 1931, Moucha 1963, Alberti 1965, Popescu-Gorj 1971, Murrain 1972, Misja & Kurrizi 1984, Luquet & Misja 1989a, 1989b, Gaskin 1990, Misja 1993, Beshkov 1994, 1995, Beshkov & Misja 1995, Abadjiev & Beshkov 1996a, 1996b, van Swaay & Warren 1999, Misja 2003, 2005, Striniqi-Laçeji 2008, Płóciennik *et al.* 2009, Eckweiler 2012, Striniqi-Laçeji & Misja 2013, Verovnik & Popović 2013a, 2013b, Gascoigne-Pees *et al.* 2014, Verovnik *et al.* 2014, Cuvelier & Mølgaard 2015, Šašić *et al.* 2015, Micesvki 2015, Cuvelier *et al.* 2016, Sachanowicz *et al.* 2016).

Through the years the borders of Albania have changed. Some historical butterfly observations concern localities that now are situated in the Republics of Montenegro, Kosovo or Macedonia.

Considering its area, geology and general climate there is however no doubt that Albania has a high biodiversity for butterflies and can play an important role in the conservation of some threatened and near threatened butterflies on the Mediterranean Red List (Numa *et al.* 2016).

In recent years, the country became more accessible to foreigners. Recent surveys (Eckweiler 2012, Verovnik & Popović 2013a, Šašić *et al.* 2015, Cuvelier *et al.* 2015, Micesvki 2015, Sachanowicz *et al.* 2016) increased the number of confirmed butterfly species for the country or added important extensions to their known distributions. However, the actual data remain insufficient (Verovnik & Popović 2013b) because not only new species for the country can still be expected but also the knowledge about their distributions in Albania can be vastly improved.

Increasing knowledge was the first goal of these two new expeditions in Albania that would also focus on less explored areas. For this objective we also contacted other entomologists in search for their unpublished data.

During the preparation of the surveys it soon became clear that a future review article, including all former publications, was an important second objective. For the preparation of the latest checklist by Verovnik & Popović (2013b) some major publications were not available. Thus, some species are in the checklist with a data deficient status despite the fact that there was evidence in literature for their presence. The butterfly collection in the Natural Sciences Museum of Albania in Tiranë was not

consulted by Verovnik & Popović (2013b) and has now also been studied.

We present the results of two new surveys, unpublished observations from other researchers and the analysis of the collection in the Natural Sciences Museum of Albania in Tiranë. The literature review is broadened and updated.

A comparison with the butterflies in the adjacent areas of the Republics of Montenegro, Kosovo and Macedonia is included when relevant for the interpretation of the data.

After inclusion and analysis of all the data, a new checklist for the Albanian butterflies is presented and an atlas (Supplementary material S4) is provided including dot distribution maps for all species that are confirmed according to the broadest possible background available to us, at this time.

Methods

New surveys (from 25.vi to 25.vii.2017) by two teams of the VVE Workgroup Butterflies (VVE1: Sylvain Cuvelier and Jurgen Couckuyt; VVE2: Laurian Parmentier, Thomas Maertens and Delphine Vincke) were carried out in less explored areas, mainly in central and northern Albania. Potential interesting localities were selected using Google Earth and the online topographic map of the ASIG Geoportal.

During our surveys, coordinates and altitudes were obtained in the field with GPS (Garmin eTrex 30 by VVE1, Garmin Oregon 750 by VVE2).

Most of the butterflies were netted or photographed for identification and released. Voucher specimens were collected as proof or for further identification (genitalia or DNA barcoding). The research and collecting of voucher specimens was endorsed (No 4662 on 12.vi.2017) by the Ministry of Environment, Republic of Albania, in accordance with the provisions of the national legal framework on nature protection, namely the Law "On biodiversity protection", No 9587, of 20.6.2016.

Other researchers were contacted, requesting non-published observations. The data that were kindly provided are included in S4 together with the data from the literature that was screened to obtain the largest possible database on the Albanian butterflies.

The collection stored in the Natural Sciences Museum of Albania in Tiranë was studied. Relevant specimens and their labels were photographed.

When needed to obtain a certain identification, genitalia of selected specimens were examined: *Leptidea sinapis* / *juvernica*, *Melitaea athalia* / *aurelia* / *diamina*, *Hipparchia fagi* / *syriaca*, *Hipparchia semele* / *volgensis* / *senhes*, *Erebia ottomana* / *cassioides*, *Aricia agestis* / *artaxerxes*, *Plebejus argus* / *idas* / *argyrognomon*, *Gegenes* and *Pyrgus species*. All collected *Plebejus* were also checked by USB microscope for the presence of a spine on the tibia of the forelegs, confirming *P. argus*.

DNA barcoding was used for the identification of *Melitaea phoebe* / *M. ornata* and to confirm the identification of *Pyrgus andromedae* and *Pseudochazara tiphone*.

An adapted digital map of Albania (Cuvelier & Mølgaard 2015) was used with the DMAP distribution mapping software to produce dot distribution maps.

As the historical borders of Albania have changed and to be as complete as possible, we have maintained all the historical observations that now are from nearby areas in the Republics of Montenegro, Kosovo and Macedonia and also included our observations from localities near the Albanian border.

Photographs were taken with a Nikon D90 and a Panasonic DMC-FZ1000 camera (VVE1) or with a Canon D70, an Apple iPhone 5 and Apple iPhone 6 (VVE2). For macrophotography VVE1 used a Sigma 180 mm macro lens and VVE2 worked with a Canon 100 mm macro objective. The photographs of genitalia and androconial scales were taken with a Dino-lite 5Mp USB or a Conrad Components DP-M17 microscope device.

The nomenclature follows Fauna Europaea (consulted on 15.xii.2017) except for *Melitaea ornata* (Christoph, 1893) (replacing *Melitaea telona*), *Pseudochazara tisiphone* (Brown, 1980) (replacing *Pseudochazara mniszecchii*) and for the *Polyommatus* blue butterflies where the nomenclature follows Talavera *et al.* (2012). *Leptidea juvernica* (Williams, 1946) is added.

Abbreviations used:

RKS: Republic of Kosovo

MNE: Republic of Montenegro

MAC: Republic of Macedonia

AP: Anila Paparisto

JC: Jurgen Couckuyt

LP: Laurian Parmentier

SC: Sylvain Cuvelier

Status:

1: species with strong evidence coming from different sources and/or voucher specimens in collections.

DD: data deficient species are lacking essential information (i.e. voucher specimens with precise locality) or have been questioned by previous reviewers or have not been confirmed since decades.

P: potential species with known occurrence in the adjacent areas of MNE, RKS or MAC. Potential habitats are present in Albania.

O: species that have been cited but are not expected for Albania.

Literature review

An attempt was made to include all publications about Albanian butterflies. For this review we did not search for or include open source data from the Internet. Some reasons for this are obvious: the difficulties to check and control the validity of records, webpages that disappear or become inaccessible, etc.

Rebel & Zerny (1931) were the first to publish a synthesis of personal surveys and data from other researchers including localities of all the observations. At that time, the borders of Albania were different from now. Some localities in this first review article are now situated in the neighbouring countries. For the former Albanian territory this publication mentioned 172 species.

In the notes, attention will be given to many of these first records for Albania. Here the names used are as given in the publication: *Hesperia alveus* Hb., *Hesperia Foulquieri* Obthr., *Hesperia orbifer* H.S., *Pontia daplidice* L., *Pontia chloridice* Hb., *Colias hyale* L., *Chrysophanus hippothoe* L., *Lycaena decolorata* Stgr., *Lycaena zephyrus* Friv., *Lycaena medon* Hufn. with a quote about one typical specimen of the forma *allous* Hb. from Kula e Lumës, *Lycaena admetus Ripperti* Frr. with a quote that the two specimens could not be separated from *Ripperti* from southern France, *Lycaena eroides*, *Apatura ilia* Schiff. with a quote about one ♂ forma *metis* Frr. from Tirana, *Limenitis rivularis* Scop., *Argynnis amathusia* Esp. from Zljeb, a locality that presently is in RKS, *M. phoebe* Knoch quoting similarities with the subspecies *ogygia* Fruhst. from the Greek island Poros, *Satyrus fagi* Scop., *S. syriaca* Stgr., *Satyrus semele* L. quoting *apenninigena* Ver. and *senthes* Fruhst., *Erebia tyndarus* (Esp.) *balcanica* Rbl. quoting the forma *macedonica* Buresch for some Albanian specimens, *Erebia gorge albanica* Rbl. with a quote that 2 ♂ from Korab were approaching the subspecies *hercegovinensis*, *Erebia rhodopensis* Nick. from Mt. Kobilica, a peak in the Šar Mountains now on the border between MAC and RKS, *Coenonympha typhon* Rott., *C. satyrion* Esp. *skypetarum* nov. subsp. with a quote about the close similarity with *orientalis* Rbl. and *Pararge climene*.

In Warren (1936) confirmation was given for three *Erebia* species: *Erebia medusa* (Denis & Schiffermüller, 1775), *E. oeme* (Hübner, 1804) and *E. gorge* (Hübner, 1804).

In 1959, Moucha visited Albania and published (Moucha 1963), his observations mentioning the localities. No new species for the country were included. Misja (1993) stated that this material is not available in Albania and could also not be checked by him for his 2005 publication. Taking into account changes in the taxonomy since this publication, there are no unexpected findings.

In 1961 a new expedition to Albania was organised by a German team. The results were partly published by Alberti (1965) for the HesperIIDae and by Popescu-Gorj (1971) for the genus *Erebia*. These articles do not include new species for Albania.

A first checklist, unfortunately without details about localities, was published by Murraj (1972) mentioning 93 species. After a first correction, the list contains only 92 species as *Pararge anthe* and *P. bresseis* are different names for the two sexes of *Chazara briseis* (Linnaeus, 1764) and these were included as two different species. Rebel (1903) and Rebel (1917) were cited but Rebel & Zerny (1931) apparently was not available to this author as it was not included in the bibliography.

The following taxa were cited for the first time for Albania: *Limenitis camilla*, *Melitaea maturna*, *M. parthenia*, *Melanargia lachesis*, *Satyrus hermione*, *Pararge alcyone*, *Coenonympha iphis*, *Heteropterus morpheus*, *Pamphila palaemon* (Pallas, 1771), *Hesperia tessellum* and *Thecla pruni*. At the end of the publication Murraj mentioned that all material, gathered in the “ancient Institut de Sciences” together with material from fieldwork during the years 1958–1964, allowed him to

note 82 species, which brings additional confusion to the consistency of this list. Also striking is the fact that some of these species were not included in subsequent local lists (Misja & Kurrizi 1984, Misja 1993 and Misja 2005) without obvious reasons for these omissions. Verovnik & Popović (2013b) included a selection of the taxa in their checklist, some with and others without a specific annotation.

Some unexpected identifications can already be adapted and some inconsistencies can be found throughout the article: *L. camilla* is in fact *Limenitis reducta* Staudinger, 1901 as can be seen from the figure in Plate 4. *Argynnis ino* is lacking in the list and not included in a figure but the species was mentioned in the text. *Melitaea phoebe* was not included in the list but is mentioned in the text and figured in Plate 4. *Melanargia lachesis* (Hübner, 1790) is in fact a pale *M. larissa* (Geyer, 1828) figured in Plate 6 and will not be retained in the new checklist. It is also the only citation of this western European species in the literature covering Albania. The other taxa will be reviewed in the notes where appropriate.

The next list was published in 1984 by Misja & Kurrizi and based on the available literature and personal observations, including 180 species for Albania. Cited for the first time are: *Spialia sertorius* Hffmegg., *Colias australis* Vrty, *Lycaeides idas* L., *Lysandra Escheri* Hbn., *Lysandra thersites* Cant.-Champ., *Agrodiaetus ripartii* Frr., *Danaus chrysippus* L., *Limenitis reducta* Stgr., *Erebia aethiopella* Hffmegg., *Pseudochazara mamurra* H-Sch. and *Satyrus actaea* Esp.

S. sertorius was included as personal observation and also based on literature. However, the citation of Rebel & Zerny (1931) was not well verified: "Sicher unrichtige Angabe, da die Art nach Warren östlich der Adria fehlt." Furthermore, it is striking that *Spialia orbifer* (Hübner, 1823) was not included in this list, adding doubts about the identification of the *Spialia* specimens.

C. australis, now *Colias alfacariensis* Ribbe, 1905, was mentioned for the first time from Albania and Misja mentioned not having observed *Colias hyale* (Linnaeus, 1758) himself, but it remained in their list, based on Rebel & Zerny (1931).

E. aethiopella was cited because it was listed in Rebel & Zerny (1931) as *Erebia rhodopensis* Nicholl, 1900 from Kobilica, a locality in the Šar Planina and now outside the current Albanian territory.

Pseudochazara mamurra H.-Sch. was mentioned from Qafa e Qarrit (Korçë) and was observed on 5.ix.1979. This identification needs to be evaluated in the light of former taxonomy and will be reviewed in the respective note. For the first time *Satyrus actaea* (Esper, 1781), a western European species, was unexpectedly reported from different localities and was listed together with *Satyrus ferula* F.

Luquet & Misja (1989a) presented more observations of *Danaus chrysippus* (Linnaeus, 1758) and the same authors (1989b) recorded a spectacular aberration of *Melitaea didyma* (Esper, 1778).

Gaskin (1990) provided new data from a survey during the first week of September 1988. He recorded 27 species.

No new species for Albania were found. He correctly mentioned *Pontia edusa* (Fabricius, 1777) for the first time from Albania instead of *Pontia daplidice* (Linnaeus, 1758) and *Hipparchia syriaca* (Staudinger, 1871) that had been listed in previous articles as *Hipparchia alcyone* (Denis & Schiffermüller, 1775) or *Hipparchia hermione* (Linnaeus, 1764). The confusion and lack of evidence-based documentation concerning *H. fagi*/*H. syriaca* can be found in later publications.

After the congress "le 5e Congrès International sur la Zoogéographie et l'Ecologie de la Grèce et des régions avoisinantes" in Iraklio, Misja (1993) published an important article that has often been overlooked. It included personal observations, data from Rebel & Zerny (1931) and Moucha (1963) mentioning 181 species for Albania. Three species (names as in the publication) are new for the country: *Elphinstonia charlonia* Donz., *Pseudochazara graeca* Stgr. and *P. cingovskii* Gross. All three will be discussed in more detail in their respective notes.

Beshkov (1994) and Beshkov & Misja (1995) added further support for species that were already known for Albania.

In 1995, Beshkov was the first to report *Muschampia proto* (Ochsenheimer, 1808) and *Hipparchia volgensis delattini* Kudrna, 1975 following dissection of male and female genitalia. He also confirmed *H. syriaca* including photographs of male and female genitalia in the publication.

Abadjiev & Beshkov (1996a) brought the first evidence for *Hipparchia senthes* (Frühstorfer, 1908). They confirmed *Pieris krueperi* (Staudinger, 1860) and *Gonepteryx farinosa* (Zeller, 1847) after more than 60 years and Abadjiev & Beshkov (1996b) gave further support for species that were already known for Albania.

In van Swaay & Warren (1999) a new synthesis for Albania was presented. Compiler for Albania is Prof. K. Misja (Instituti i Kërkimeve Biologjike, Tiranë). The list included *Carcharodus baeticus* (Rambur, 1839), *Pyrgus bellieri* (Oberthür, 1910), *Nymphalis vaualbum* (Denis & Schiffermüller, 1775), *Coenonympha tullia* (Müller, 1764) and *Satyrium pruni* (Linnaeus, 1758). *S. pruni* was even given a 5–15% distribution in Albania but has only been listed once by Murraj (1972). Some ubiquitous species like *Colias croceus* (Fourcroy, 1758), *Vanessa atalanta* (Linnaeus, 1758), *V. cardui* (Linnaeus, 1758), *Lasiommata maera* (Linnaeus, 1758) and *Coenonympha pamphilus* (Linnaeus, 1758) are lacking despite being well reported in earlier publications.

In Misja (2003) data were given for the prime butterfly areas in Albania and include localities of *Parnassius apollo* (Linnaeus, 1758), *Euphydryas aurinia* (Rottemburg, 1775), *Lycaena ottomanus* (Lefèbvre, 1830) and *Phengaris arion* (Linnaeus, 1758).

The publication by Misja (2005) represents the only time that dot distribution maps for all species were included. This book is no longer on the market, very difficult to obtain and by consequence it has not been cited in several articles since its publication in 2005.

Different details are striking: *S. sertorius* was again included and figured and *S. orbifer* is lacking. *Tarucus*

theophrastus (Fabricius, 1793) was not mentioned in the list but it was described (p. 91), figured (Table 12) and mapped on page 219. *Euphydryas maturna* (Linnaeus, 1758) was described and figured based on museum specimens. In the summary (p. 39) *Erebia arvernensis* (Oberthür, 1908) was included but in the text and in Table 21 it was replaced by *Erebia tyndarus* (Esper, 1781).

Hipparchia alcyone (Denis & Schiffermüller, 1775), *H. fagi* (Scopoli, 1763) and *H. semele* (Linnaeus, 1758) were included. Also *S. actaea* was again included in the list, the text and Table 24. The figures of *S. actaea* are indeed suggestive for this species. Tracing back this material for elucidation will be discussed in the notes.

Striniqi-Laçe (2008) described the threatened insects in the area of Shkodra and Malësia e Madhe. No new species were included. For a few species the changes in taxonomy were not applied and some were cited from places and habitats that are unexpected or not precisely cited: *Carcharodus floccifera* (Zeller, 1847) at Tarabosh, *Spialia phlomidis* (Herrich-Schäffer, 1845) from Tarabosh (Shkodër), *Pieris krueperi* (Staudinger, 1860) from Shirokë, one of the citations for *Erebia pronoe* (Esper, 1780) from Taraboshi (Shkodër) and one *Erebia melas* (Herbst, 1796) from Shirokë (Shkodër).

Plóciennik *et al.* (2009) mentioned a few observations of butterflies confirming known species.

Eckweiler (2012) reported his observations of *Pseudochazara mamurra amymone* Brown, 1976 and *P. mniszechii tisiphone* Brown, 1980 in Albania. Unaware of earlier articles he stated "... found in Albania for the first time" for *P. amymone* and "... also found in Albania for the first time" for *P. tisiphone*.

Striniqi-Laçe & Misja (2013) gave an overview of the threatened entomofauna of northern Albania. No new species are included. Referring to our comment above, concerning the article from Striniqi-Laçe (2008) it is unclear why some of the data were not repeated. For this additional reason, some data in Striniqi-Laçe (2008) and Striniqi-Laçe & Misja (2013) will be interpreted with caution.

Verovnik & Popović (2013a) mentioned three new species for Albania: *Colias aurorina* (Herrich-Schäffer, 1850), *Pieris balcana* Lorkovic, 1970 and *A. iris* (Linnaeus, 1758). *Erebia rhodopensis* Nicholl, 1900 was mentioned from the Albanian side of Mali i Gramozit, thus representing a new species for the current Albanian territory.

Verovnik & Popović (2013b) published a new checklist. They included personal observations and available literature with important updates, radical amendments and the much needed taxonomical adaptations. 196 butterfly species were reported for Albania. Annotations were included for: *Pyrgus alveus* (Hübner, 1803)/*P. bellieri*, *Spialia orbifer*/*S. sertorius*, *Muschampia tessellum* (Hübner, 1803), *Carterocephalus palaemon* (Pallas, 1771), *Heteropterus morpheus* (Pallas, 1771), *Pontia edusa* (Fabricius, 1777)/*P. daplidice*, *C. hyale*/*C. alfacariensis*, *Lycaena candens* (Herrich-Schäffer, 1844)/*L. hippothoe* (Linnaeus, 1761), *Aricia artaxerxes* (Fabricius, 1793), *Polyommatus eros* (Ochsenheimer, 1808), *Melitaea aurelia* Nickerl, 1850, *H. syriaca*/

H. alcyone/*H. hermione*, *H. semele*/*H. volgensis* (Mazochin-Porshnjakov, 1952)/*H. senthes*, *P. mniszechii*, *P. amymone*, *Erebia cassioides* (Reiner & Hochenwarth, 1792) and *Coenonympha rhodopensis* Elwes, 1900/*C. tullia*. The authors also excluded some species mentioned from previous publications: *M. lachesis*, *S. actaea*, *Euchloe penia* (Freyer, 1851) and *N. vaualbum* (Denis & Schiffermüller, 1775). *A. artaxerxes* was confirmed from Mali i Gramozit.

Unfortunately, two publications (Misja 1993, 2005) were not available to prepare this checklist. As a consequence, different statements lack relevant data from these two references. Some data were included from old publications, including places that are located outside the current Albanian territory. This was not taken into account for different species by the authors. Comments about such issues are given in their notes.

Verovnik *et al.* (2014) provided more data on the distribution of *P. amymone* in southeastern Albania. Gascoigne-Pees *et al.* (2014) documented the lifecycle and ecology of *P. amymone* and Cuvelier & Mølgaard (2015) described the variability and the androconial scales of Albanian *P. amymone* and *P. tisiphone*.

Šašić *et al.* (2015) gave an overview of recent surveys in southeastern Albania including 143 species. Two new species were added: *Melitaea ornata* (Christoph, 1893) and *Cupido alcetas* (Hoffmannsegg, 1804).

Micevski *et al.* (2015) reported on new surveys, included one new species, *Anthocharis damone* Boisduval, 1836, and confirmed *Apatura metis* Freyer, 1829.

Cuvelier *et al.* (2016) documented two extreme forms of *P. amymone* from Albania.

Sachanowicz *et al.* (2016) reported their surveys and added two new species: *Melitaea diamina* (Lang, 1789) and *Cacyreus marshalli* Butler, 1898. They provided a new locality for *A. damone* and confirmed *C. aurorina*, *P. balcana* and *A. metis*.

A table with all the taxa, as mentioned in the major review articles, is available as supplementary material (S1).

Results of recent surveys and from unpublished observations

The results of the two recent surveys by VVE1 and VVE 2 are summarized in the supplementary material (S2). A short description of the localities is presented in the supplementary material (S3). Relevant data are included hereunder in the notes and are placed in a broader context with former publications and checklists.

Notes

We here provide the background for the status of many species in the new checklist and also include new data on their Albanian distribution. All recent observations, the analysis of the collection in the Natural Sciences Museum of Albania in Tiranë, unpublished data by other researchers and all available references have been used to compile these notes.

Pyrgus alveus (Hübner, 1803) and ***Pyrgus bellieri*** (Oberthür, 1910)

Rebel & Zerny (1931) were the first to provide evidence from Korab, Dobri Dol for *P. alveus* and, more surprisingly, they also included the western European taxon *Pyrgus foulquieri* (Oberthür, 1910), now *Pyrgus bellieri* (Oberthür, 1910), based on two specimens from Bështriq. It was said that the identification was based on external characters. Alberti (1965) writes “dieser Fund soll durch Genitaluntersuchung gesichert sein” meaning that such an identification needs to be confirmed by the dissection of the genitalia. This is, however, not the interpretation of Verovnik & Popović (2013b) who stated that Alberti (1965) confirmed the record by dissection of the genitalia. Jakšić (2007) documents *P. alveus* from the same mountain in RKS. We agree with Verovnik & Popović (2013b) and give *P. bellieri* the status 0 (see p. 64) as there is no evidence and it is not to be expected for the Balkans. The historical quote about these two specimens is referred to *P. alveus*. VVE1 found *P. alveus* in low numbers

in many of the visited localities in the N. Albanian Alps where it seems widespread (S4 map 173).

Pyrgus andromedae (Wallengren, 1853). **New to Albania.** (Fig. 2a–e; plate 1)

In southeastern Europe, *P. andromedae* has been documented from the Dinaric chain (Kudrna 2015) to Romania (Dincă *et al.* 2008) but remained unknown from Albania.

This species was collected in three Albanian localities (S4 map 174). On 28.vi.2017, VVE1 collected a single worn male north of Vermosh (1870 m). Despite an intensive search no more specimens were found and the foodplant, *Dryas octopetala*, was very local. On 8.vii.2017, different specimens were seen by VVE1 at Mali i Koritnikut between 2168 to 2388 m, both in Albania and in RKS. On 9.vii.2017, different specimens were again observed by VVE1 on Maja e Gjallicës at 2424 m. This discovery is not surprising since *P. andromedae* is known from MAC (Krpač & Darcemont 2012, Abdija *et al.* 2013) and from MNE (Tolman 1997). *P. andromedae* will probably be found locally on other high mountains in northern Albania.



Fig. 2a. Habitat of *Pyrgus andromedae*, N. Vermosh, 1870 m, 28.vi.2017 (© SC).

Fig. 2b. *Dryas octopetala*, N. Vermosh, 1870 m, 28.vi.2017 (© SC).

Fig. 2c. Habitat of *Pyrgus andromedae*, Maja e Gjallicës, 2424 m, 9.vii.2017 (© SC).

Fig. 2d. Habitat of *Pyrgus andromedae*, Mali i Koritnikut, 2348 m, 8.vii.2017 (© SC).

Fig. 2e. *Pyrgus andromedae* ♀, Malet i Koritnikut, 2348 m, 8.vii.2017 (© JC).

Fig. 2f. *Pyrgus andromedae* ♀, Malet i Koritnikut, 2371 m, 8.vii.2017 (© JC).

Spialia orbifer (Hübner, 1823) and ***Spialia sertorius*** (Hoffmannsegg, 1804)

Rebel & Zerny (1931) and Alberti (1965) already mentioned *S. orbifer* from different Albanian localities.

Misja & Kurrizi (1984) and Misja (2005) only list *S. sertorius*, a species that is expected to have its southeastern limit along the northern Adriatic coast and the Croatian island Krk (Verovnik & Popović 2013). In

1999, van Swaay & Warren mentioned both *Spialia* species for the country. In all remaining publications only *S. orbifer* has been listed. Different *Spialia* specimens were found in the Natural Sciences Museum of Albania and have the typical external characteristics of *S. orbifer*. No further action was taken to control the genitalia. Based on the big distance to the nearest populations, *S. sertorius* is given the status 0 in the checklist and the literature observations are referred to *S. orbifer*.

Muschampia tessellum (Hübner, 1803)

Only Murraj (1972, plate 7) listed and figured a specimen of this big and relatively easy to observe Skipper without mentioning any detail on locality and date. It was shown above that this checklist includes inconsistencies and discrepancies yielding doubts about this inclusion. Verovnik & Popović (2013b) included *M. tessellum* as DD (data deficient species) based on this publication and the fact that it is known from areas nearby SE Albania in MAC (Krpáč *et al.* 2011, Krpáč & Darcemont 2012, Švara *et al.* 2016) and Greece (Pamperis 2009). In addition to the lack of data in Murraj (1972), no material of *M. tessellum* was found in the Natural Sciences Museum of Albania. Therefore, we consider that there is no evidence that *M. tessellum* is present in Albania. Habitats for *M. tessellum* are probably available and we consider it as a potential species to be discovered in the country.



Fig. 3a. Habitat of *Carterocephalus palaemon*, Thethi to Qafa e Valbonës, 1303 m, 30.vi.2017 (© SC).

Fig. 3b. *Carterocephalus palaemon*, Maja e Rosit, 1412 m, 4.vii.2017 (© JC).

Heteropterus morpheus (Pallas, 1771)

Only Murraj (1972) mentioned and figured a specimen in Plate 7 without providing any detail concerning the locality. Verovnik & Popović (2013b) included *H. morpheus* in the checklist with a DD status and mentioned that the nearest occurrence is from northern MNE; this is also confirmed in the map of Kudrna *et al.* (2015). This might well be the southern limit of this species in the western Balkan. During the two surveys no suitable habitats were found in the N. Albanian Alps. Therefore, *H. morpheus* is listed with status 0 in the checklist.

Pieris balcana Lorkovic, 1970 and ***Pieris napi*** (Linnaeus, 1758)

Collected *Pieris* specimens from many localities in the N. Albanian Alps were suggestive for *P. balcana* but often intermediate specimens were collected in the vicinity. Genitalia are of no use and DNA barcoding does not separate them. H. Ziegler identified the collected *Pieris* based on photographs of the underside of the hindwing. The results are included in the maps (S4 map 142, 147).

Carcharodus baeticus (Rambur, 1839)

It is only in van Swaay & Warren (1999) that *C. baeticus* was cited and indicated with 5–15% present distribution. There is no evidence at all for the presence of *C. baeticus* in the Balkans. Therefore it is listed with status 0.

Carterocephalus palaemon (Pallas, 1771). Confirmed for Albania. (Fig 3a–b)

Only Murraj (1972) listed *C. palaemon* without providing details or figures. Verovnik & Popović (2013b) included the species as DD, probably based on this publication and the recent discovery and observations in MAC (Verovnik & Micevski 2008, Verovnik *et al.* 2010, Švara *et al.* 2015). It is not present in northwestern Greece (Pamperis 2009). *C. palaemon* was found in 3 localities (S4 map 35). A first specimen was collected by VVE1 on 30.vi.2017 above Thethi (1303 m), the second specimen was collected by VVE1 north of Valbona (1419 m) and a third specimen was observed by VVE2 on 25.vii.2017 near Gurrë-Lurë (1105 m). These three specimens were not fresh giving the impression that *C. palaemon* might be observed in higher numbers when searching earlier in the year. It is expected to be local in the northern half of Albania. More research is needed to get a better idea on its distribution.

Pontia edusa (Fabricius, 1777) and ***Pontia daplidice*** (Linnaeus, 1758)

Different historical sources mentioned *P. daplidice* (Rebel & Zerny 1931, Moucha 1963, Murraj 1972, Misja & Kurrizi 1984, Misja 1993, van Swaay & Warren 1999, Misja 2005). This is not surprising, considering that it is only since 1982 that Geiger & Scholl (1982) separated *P. edusa* from *P. daplidice*. Gaskin (1990) was the first to cite *P. edusa* for Albania. *P. daplidice* was for a long time considered as a southwestern European species but recent research (John *et al.* 2013) has shown that only this species is present in Cyprus and the nearby countries of the Levant. There is however no evidence for the western Balkan and we refer the Albanian *P. daplidice* observations to *P. edusa* and the status of *P. daplidice* in this list is 0.

Pontia chloridice (Hübner, 1813)

This species was mentioned by Rebel & Zerny (1931) from Orosh. In 1993, Misja expresses doubts about the presence of *P. chloridice* in Albania. Misja (2005) repeats the reference by Rebel & Zerny (1931) but he does again not include other observations. In the collection of the Natural Sciences Museum of Albania butterflies labeled as

P. chloridice were found but all turned out to be *Euchloe ausonia* (Hübner, 1804). Many river valleys with wide alluviums are present in Albania and remind of the Vardar river in MAC where *P. chloridice* is present (Franeta *et al.* 2012). We could see that such potential habitats are intensively exploited and as the last citation of *P. chloridice* is old, we do not automatically extrapolate that *P. chloridice* is still present in Albania and give the species a DD status. Research in the numerous river valleys with wide alluviums is needed to clarify the status of *P. chloridice* in Albania.

Euchloe penia (Freyer, 1851) (Fig. 4a–c)

Verovnik & Popović (2013b) do not include *E. penia* in the checklist. They refer to the Red data book of European butterflies (van Swaay & Warren 1999) where *E. penia* is

included for Albania. In the review of the published records they write: “as none of these records was published separately, their inclusion should be regarded as questionable”. In their conclusion they expressed that the presence cannot be entirely ruled out. At that time, they were not aware of the published evidence by Misja (2005). Striniqi-Laçej & Misja (2013) mention the presence of *E. penia* in Peshkopi and Kukës. In 2016, Sachanowicz did draw attention to the evidence in Misja (2005) and proposed to add *E. penia* to the country’s list. We include photographs of the specimens and their corresponding labels found in the Natural Sciences Museum of Albania in Tiranë and confirm the presence of *E. penia*. For the moment *E. penia* is only known from three Albanian localities (S4 map 72).



Fig. 4. *Euchloe penia*; a–b ♂ upper- and underside; c ♀ upperside; Kumbull Gram, Dibër, 20.vii.1986, coll. K. Misja, Natural Sciences Museum of Albania (© AP).

Colias alfajariensis Ribbe, 1905 and ***Colias hyale*** (Linnaeus, 1758)

C. hyale has often been mentioned in the publications starting with Rebel & Zerny (1931). The identification of *C. hyale* and *C. alfajariensis*, based on external characters, is hazardous and not reliable due to the variability and close resemblance of these two species. Differences in the morphology of their caterpillars are useful for the identification but we are not aware of any evidence of early stages of *C. hyale* from Albania. A potential migrating *C. hyale* cannot entirely be excluded but it is unlikely in southwestern Balkan. We agree with Sachanowicz (2016) and *C. hyale* is listed with status 0. All the Albanian *C. hyale* observations from literature are referred to *C. alfajariensis*.

Colias caucasica balcanica Rebel, 1901. **New to Albania.** (Fig. 5a–e; Plate 1)

Franeta & Đurić (2011) reviewed the distribution of *C. caucasica balcanica* and wrote that it was reasonable to conclude that it inhabits mountains in Albania as the known distribution reaches mountains on the borders of the country. A first sighting of a fast and deep orange *Colias* on 9.vii.2017 near Kolesjan (1238 m) left VVE1 with doubts (S4 map 46). Despite a long search, it was not possible to capture this butterfly but it was interesting to find that the foodplants, *Chamaecytisus* spec., were common in the surrounding area. On 10.vii.2017 and 12.vii.2017, VVE1 found a metapopulation north of Mali i Korabit between 1500–1700 m and collected four voucher specimens. Many males and females were worn. On 14.vii.2017, VVE1 again found 2 fresh males of *C. caucasica* at 1950 m in the mountains north of Vermosh, nearby the border with MNE and collected a voucher specimen. *C. caucasica* has been confirmed recently from nearby localities in MAC (Micevski & Micevski 2006, Verovnik *et al.* 2010, Krpač 2013) and after many years also for MNE (Nahirnić 2015). It is present in

northwestern Greece (Pamperis 2009). More research is needed to gain better insight into its distribution in Albania.

Leptidea juvernica Williams, 1946. **New to Albania.** (Fig. 6a–c, Plate 1)

Leptidea sinapis (Linnaeus, 1758) is the only taxon of the *L. sinapis* complex that has been mentioned in publications so far. This is not surprising for the older publications as the discovery of the cryptic diversity in the wood white *Leptidea* butterflies, as a triplet, was only described in 2011 (Dincă *et al.*). It is however surprising that, since then, only Šašić *et al.* (2015) cited the work of Hubrechts (2013) where some genitalia measurements were studied from Albanian *Leptidea* searching for potential *L. juvernica* but documenting only *L. sinapis*. The genitalia of all collected *Leptidea* of VVE1 and VVE2, 29 males and 16 females, were prepared and measured. We found that both *L. sinapis* and *L. juvernica* are present in Albania. 3♂ *L. juvernica* were found nearby Çerem (S4 map 104) on 05.vii.2017 in the N. Albanian Alps in sympatry with *L. sinapis*. Jakšić & Ristić (1999) and Jakšić (2007) documented *Leptidea reali* Reissinger, 1989 from Mt. Paštrik (RKS) nearby the Albanian border. With the actual knowledge on the distribution of the *L. sinapis* complex we refer this observation to *L. juvernica*. Shtinkov *et al.* (2016) confirm by DNA barcoding that the Balkan populations of the wood white butterflies belong only to *L. sinapis* and *L. juvernica* that is confined to humid mountain habitats, in the eastern Balkan. For the moment *L. juvernica* has been found from only one locality but it can be expected in other suitable places in a wider area. It is possible that in Albania it is also confined to humid mountain biotopes as it is in Bulgaria and northeastern Greece.

Satyrrium pruni (Linnaeus, 1758)

S. pruni was first mentioned by Murraj (1972) in his checklist without any detail or figure. In van Swaay &

Warren (1999) the species is even given a distribution of 5–15 % for Albania but is not mentioned at all in Misja (2005). Verovnik & Popović (2013b) included it in their checklist, probably extrapolating on recent observations in adjacent areas in MAC (Verovnik *et al.* 2010, Abdija 2013b, Melovski & Bozhinovsk 2014) and nearby Podgorica (Sobczyk & Gligorovic 2016) in MNE. It is also present in northern Greece (Pamperis 2009). No

specimens were found in the Natural Sciences Museum of Albania in Tiranë and Prof. K. Misja confirmed that he has never observed the species. In the southern Balkan, *S. pruni* is a very local species and for the moment, there is no evidence that *S. pruni* has been found in Albania. We consider *S. pruni* as a potential species to be discovered in Albania.

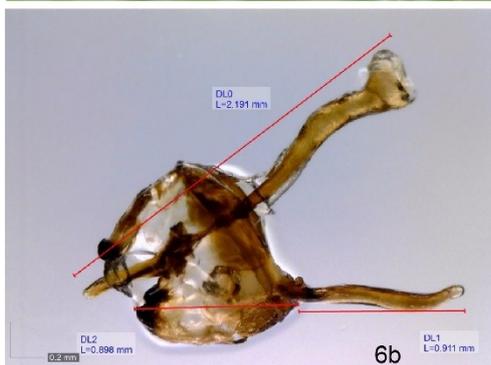


Fig. 5a. Habitat of *Colias caucasica*, Vau i Çajës, 1712 m, 12.vii.2017 (© SC).

Fig. 5b. Habitat of *Colias caucasica*, Vau i Çajës, 1588 m, 12.vii.2017 (© SC).

Fig. 5c. *Chamaecytisus* spec., Vau i Çajës, 1588 m, 14.vii.2017 (© SC).

Fig. 5d. Habitat of *Colias caucasica*, N Vermosh, 1948 m, 12.vii.2017 (© JC).

Fig. 5e. *Colias caucasica* ♂, Vau i Çajës, 1588 m, 12.vii.2017 (© JC).

Fig. 6a. Habitat of *Leptidea juvernica* and *Melitaea diamina*, Çerem, 1633 m, 5.vii.2017 (© SC).

Fig. 6b–c. ♂ genitalia of 2 *Leptidea juvernica*, Çerem, 1556 m, 5.vii.2017, coll. SC (© SC).

Lycaena candens (Herrich-Schäffer, 1844) and ***Lycaena hippothoe*** (Linnaeus, 1761)

Historical records of *L. hippothoe* have been cited by different authors. Verovnik & Popović (2013b) mentioned that it is highly unlikely as there are no close confirmed records. We give status 0 to *L. hippothoe* and refer the historical observations to *L. candens*.

Tarucus theophrastus (Fabricius, 1793)

T. theophrastus has only been listed by Misja (2005) who mentions an observation from Vorë. This is far out of the known range of this species. Also Sachanowicz *et al.* (2016) expressed that this was very doubtful. The collection of the Natural Sciences Museum of Albania in Tiranë was checked for specimens that were labeled as *T. theophrastus*. It turned out to be a misidentified *Leptotes pirithous* (Linnaeus, 1767). *T. theophrastus* is given status 0 in the checklist and referred to *L. pirithous*.

Kretania sephirus (Frivaldzky, 1835)

Rebel & Zerny (1931) already mention *K. sephirus* but for an unknown reason this species is completely lacking in all subsequent publications and review articles and is mentioned again for the first time in 2015 by Šašić *et al.* *K. sephirus* was documented from four localities in the N. Albanian Alps (S4 map 98) where it was present in good numbers. More research is needed to get a better idea on its distribution in Albania.

Aricia artaxerxes (Fabricius, 1793)

Rebel & Zerny (1931) probably were the first to provide evidence for *A. artaxerxes* in Albania: "ein Stück von Kula e Lumës ist typischer *allous* Hb.". Verovnik & Popović (2013b) confirmed its presence in Albania on the northwestern slopes of Mt. Gramoz. We found it widely distributed from central to northern Albania. In the N. Albanian Alps, *A. artaxerxes* (S4 map 19) was more common than *Aricia agestis* (Denis & Schiffermüller, 1775).

Polyommatus eroides (Frivaldzky, 1835)

Rebel & Zerny (1931), Misja & Kurrizi (1983), van Swaay & Warren (1993) and Misja (2005) mention this species. Later *P. eroides* was downgraded (Vodolazhsky & Stradomsky 2008) to a subspecific rank of *P. eros* (Ochsenheimer, 1808) as no genetic differentiation had been found between them. Surprised about some low altitude localities given in literature, we controlled the collection in the Natural Sciences Museum of Albania in Tiranë and some specimens turned out to be *Polyommatus icarus* (Linnaeus, 1758). These changes in identification have been applied in the map of *P. eros* (S4). We confirm the presence of small specimens of *P. eros* that were found in good numbers in four high localities in the N. Albanian Alps. In the checklist *P. eroides* is given status 0 and is referred to *P. eros*.

Apatura iris (Linnaeus, 1758)

Verovnik & Popović (2013a) were the first to record *A. iris* for Albania and a few subsequent observations have confirmed *A. iris* from the southeastern part of Albania (Šašić *et al.* 2015). On 01.vii.2017, VVE1 collected one ♂ *A. iris*, probably a vagrant, at 1567 m on the Qafa Buni i Thorës (S4 map 7) between Thethi and Bogë in the N. Albanian Alps. This was expected in relation to its presence in adjacent areas (Jakšić 2007, Huemer 2011, Krpač *et al.* 2011, Abdija 2013a, Krpač *et al.* 2013, Abdija 2014, Švara *et al.* 2016). It is also well documented from northwestern Greece (Pamperis 2009). More research is needed to get a better idea about its distribution in Albania.

Limenitis camilla (Linnaeus, 1764)

This species was wrongly included by Murraj (1972) as the figure in this publication clearly shows a *L. reducta*. But *L. camilla* has been cited from rather nearby localities in MAC (Krpač *et al.* 2011, Abdija 2014) and from the northern part of MNE (Švara *et al.* 2015). It has only been confirmed from northeastern Greece (Pamperis 2009). For the moment there is no evidence, but further research is needed to confirm or not the presence of *L. camilla*. Potential habitats are present, especially in the northern part of Albania where the climate is more suitable for this species.

Neptis rivularis (Scopoli, 1763)

The species was cited by Rebel & Zerny (1931) from different Albanian localities as "*Limenitis rivularis* Scop. (*camilla* auct. nec L.)" and this creates confusion. It is surprising that the widespread *Limenitis reducta* (Staudinger, 1901) was not included in this publication. Either they represented *N. rivularis* or misidentified *L. reducta*. Also Moucha (1963) cites "*Limenitis rivularis*" and again *L. reducta* is not included in the observations. *L. reducta* is mentioned, without citing *N. rivularis*, in the following lists: Misja & Kurrizi (1984), Misja (1993), van Swaay & Warren (1999) and Misja (2005). Both species are listed by Verovnik & Popović (2013a) without annotation. The specimens labeled as *N. rivularis* in the collection of the Natural Sciences Museum of Albania in Tiranë were all *L. reducta* and Prof. K. Misja confirmed that he has never observed the species. *N. rivularis* has been documented from Mt. Galičica (Krpač & Darcemont 2012) and it is also included in a conference paper for the nearby National Park of Mavrovo (Krpač 2013), in MAC. It has only been documented from northeastern Greece (Pamperis 2009). With the unexpected absence in Rebel & Zerny (1931) of *L. reducta* and the fact that since then not a single new observation has been documented, the status of *N. rivularis* is changed to DD.

Araschnia levana (Linnaeus, 1758)

This is a species that slowly expands its range in the Balkan peninsula. In MAC, *A. levana* was first recorded by Thomas (1993) and subsequently reported by Melovski (2004) as new for MAC. Since then *A. levana* has been found in more localities (Micevski & Micevski 2008a, Verovnik *et al.* 2010, Abdija *et al.* 2013a, Abdija 2014). Jakšić (1998) was the first to cite *A. levana* from RKS and more sightings from other localities have also been documented in this country (Švara *et al.* 2016, Etemi 2017). *A. levana* is known from northwestern Greece (Pamperis 2009). Not far from the Albanian border in RKS, near Breznë, VVE1 found three *A. levana* feeding on *Sambucus ebulus*. It seems plausible that *A. levana* is already present in northeastern Albania and if it is not yet the case, it will not take long before this is the next new butterfly species for Albania.

Nymphalis vaualbum (Denis & Schiffermüller, 1775)

In 1999, van Swaay & Warren listed the false comma, *N. vaualbum*. Based on this, Verovnik & Popović (2013b) mentioned that there was no published record and that the inclusion of this species by van Swaay & Warren (1999) was questionable. The species was not in their list but they suggested that the presence cannot be entirely ruled out. Also Misja (2005) did not list *N. vaualbum* and there is no evidence in the collection of the Natural Sciences Museum of Albania in Tiranë. In 2009 this butterfly was recorded for the first time in MAC from Mt. Shar Planina (Melovski & Bozhinovsk 2014) but follow up research in 2009 and 2010 revealed no further evidence of its presence. As this is a strong migrator it is not clear what the meaning of this single observation is. From personal experience of the first author in Romania and Serbia it is clear that this is a very shy butterfly that needs experience to be observed. The second half of June is probably the best moment to look for it in hot, humid tracks in dense deciduous forests with

nearby running water. Having no direct evidence for *N. vaualbum* from Albania and almost none for the adjacent areas, this species is not listed as present in the new checklist but it remains a potential target for research, especially in northeastern Albania.

Boloria titania (Esper, 1793). New to the current territory of Albania. (Fig 7a–c, Plate 1)

Rebel & Zerny (1931) mention *B. titania* from Žljeb in Albania. Presently it is a locality outside Albania, on the border between RKS and MNE. Verovnik & Popović (2013b) list *B. titania* without giving information about the source but probably this is based on Rebel & Zerny (1931).

This species is not listed by Misja (2005) and to our knowledge, *B. titania* has never been cited in any other publication from current Albania. It is not present in the collection of the Natural Sciences Museum of Albania in Tiranë. Švara *et al.* (2015) mention *B. titania* from the North of MNE. Krpač & Darcemont (2012) list *B. titania* in the red list of MAC. VVE1 found a strong but local population of *B. titania* near Çerem (1556 m) in the N. Albanian Alps (S4 map 24). It is expected that the species can be found in comparable habitats in other localities.



Fig. 7a. Habitat of *Boloria titania*, Çerem, 1556 m, 5.vii.2017 (© SC).

Fig. 7b. Habitat of *Boloria titania*, Çerem, 1670 m, 5.vii.2017 (© JC).

Fig. 7c. *Boloria titania* ♂ upperside, Çerem, 1556 m, 5.vii.2017 (© JC).

Fig. 7d. *Boloria titania* ♂ underside Çerem, 1556 m, 5.vii.2017 (© JC).

Euphydryas maturna (Linnaeus, 1758)

E. maturna was first listed by Murraj (1972). It was also mentioned by Misja & Kurrizi (1984), Misja (1993) and Misja (2005). The data were also taken over by Verovnik & Popović (2013b). Recently Sachanowicz *et al.* (2016) wrote: “the only record of *Euphydryas maturna* is based on a specimen without a label and known locality from the collection of the Museum of Natural History in Tiranë (Misja 2005). In this case, it is not even certain whether the specimen was collected in Albania.” Švara *et al.* (2015) give a single locality of *E. maturna* in the North of MNE and Sobczyk & Gligorovic (2016) cite *E. maturna* from two sites of the Zeta-Skadar Plain in MNE, nearby NW Albania. Krpač *et al.* (2012) list *E. maturna* as vulnerable in the red list of MAC and Krpač *et al.* (2013) mention different observations of *E. maturna* in the adjacent Macedonian National Park of Mavrovo. It clearly is the southern limit of *E. maturna* in the Balkan. Not having found strong evidence like the specimen without label in the collection of the Museum of Natural History in Tiranë, we list *E. maturna* as DD but it is not impossible that it will be found in the future in suitable habitats in the northern half of Albania.

Melitaea arduinna (Esper, 1783)

For the moment there is no evidence at all for this species from Albania. *M. arduinna* has been cited recently from the neighbouring countries (Pamperis 2009, Micevski *et al.* 2009a, Verovnik *et al.* 2010, Krpač *et al.* 2011, Krpač & Darcemont 2012, Krpač *et al.* 2013, Abdija *et al.* 2013, Abdija 2014, Švara *et al.* 2016) and sometimes at short distances from the Albanian border. Potential habitats are present in the country and focused research during the optimal flight period is needed.

Melitaea aurelia Nickerl, 1850

The only time that *M. aurelia* has been cited for Albania is by Murraj (1972). Verovnik (2013b) mentioned that confirmation was needed and that the presence of the species is probable. *M. aurelia* has been found in MNE (Švara *et al.* 2015), MAC (Micevski *et al.* 2009b, Krpač *et al.* 2011, Abdija 2013b) and Greece (van der Poorten & Couvelier 1997). Some small *Melitaea* males, reminding of *M. aurelia*, were dissected for identification purposes but all specimens turned out to be *Melitaea athalia* (Rottemburg, 1775). For the moment there is no evidence for *M. aurelia* and the species is not listed as occurring in Albania. Potential habitats are present and further

research certainly is needed in Albania and also in the neighbouring countries to gain better insight, supported by genitalia, concerning its distribution in the SW Balkan.

Melitaea diamina (Lang, 1789) (Fig. 8a–b)

Sachanowicz *et al.* (2016) were the first to document this species from two localities in northern Albania. Some

20 km east of these two localities, VVE1 found *M. diamina* in good numbers nearby Çerem (S4 map 123) on 5.vii.2017. *M. diamina* is known from MNE (Švara *et al.* 2015) and MAC (Abdija 2014). It is likely that the species will be found in other suitable habitats in the N. Albanian Alps.

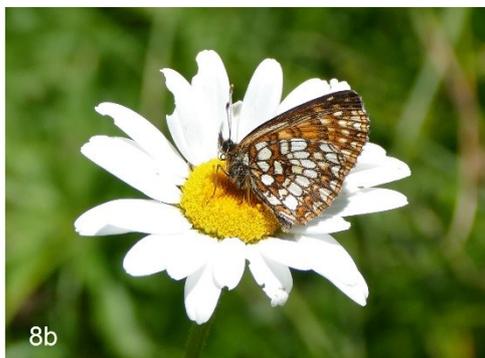


Fig. 8a. *Melitaea diamina* ♂
upperside, Çerem,
5.vii.2017 (© JC).

Fig. 8b. *Melitaea diamina* ♂
underside, Çerem, 1633 m
1633 m, 5.vii.2017 (© JC).

Melitaea ornata (Christoph, 1893)

Šašić *et al.* (2015) were the first to add *M. ornata*, confirmed by DNA barcoding, to the list of Albanian butterflies based on a single female that was collected in 2013 at Drenovë nearby Korçë. Micevski *et al.* (2015) added two more localities with determinations based only on the wing morphology and the shape of the antennal club. The authors quote that the species is probably widely distributed because it has been overlooked in the past due to the close resemblance with *Melitaea phoebe* (Denis & Schiffermüller, 1775). This is strongly supported by the multiple observations in MAC, where Verovnik *et al.* (2010) were the first to mention *M. ornata* (as *M. telona*), based only on external characters. This publication was followed by several additional observations in the southeastern part of the country (Verovnik 2012). *M. ornata* was further confirmed from MAC by Russell *et al.* (2015) and Russell & Pateman (2016) based on the red-brown colour of the heads of stage L4 and later instar larvae, providing certain information. *M. ornata* is also known from MNE (Russell 2015). All specimens of *M. phoebe*/*M. ornata*, collected by VVE1 and VVE2, were DNA barcoded. For the detailed results, we refer to the maps (S4 125, 126) summarising the present knowledge about the distributions of *M. phoebe* and *M. ornata* in Albania. More research, focusing on the earlier occurrence of the adults (April–May) and on developed larvae, is needed to gain better insight into the distribution of *M. phoebe* and *M. ornata* in Albania.

Coenonympha orientalis Rebel, 1910 and
Coenonympha gardetta (de Prunner, 1798)

Rebel & Zerny (1931) described a new subspecies, “*Coenonympha satyrion* (Esp) *skypetarum* – *arcania orientalis*” from Shkala e Bicajit quoting that it is close to *orientalis* and that most of the specimens show constant differences but are quite variable. Such specimens were also found in Abata and the Munelagebirge. Misja & Kurrizi (1984) also listed *C. satyrion*. Van Swaay & Warren (1999) listed *C. gardetta* for Albania but *C. orientalis* is not included. Misja (2005) mentions observations of both species but the figures (Plate 17) of *C. gardetta* are

suggestive of *C. orientalis*, these butterflies are present in the Natural Sciences Museum of Albania. Having checked this material we assign the putative specimens of *C. gardetta* to *C. orientalis* and *C. gardetta* is given status 0.

Coenonympha glycerion (Borkhausen, 1788)

Misja (1993) listed *C. glycerion* but this was neither repeated in van Swaay & Warren. (1999) nor in the Atlas of Misja (2005). Verovnik & Popović (2013b) listed *C. glycerion* without providing details. The species is known from Mt Durmitor in the northern half of MNE (Švara *et al.* 2015). Micevski & Micevski (2008b) documented *C. glycerion* from the NE of MAC while Krpač & Darcemont (2012) included *C. glycerion* in the red list of MAC. In 2013, Krpač *et al.* cited it from the Macedonian side of the Korab Mountain not far from the Albanian border. In Pamperis (2009) there is one question mark in northwestern Greece and the species is well documented from the northeastern part of the country. *C. glycerion* was not found in the Natural Sciences Museum of Albania in Tiranë. Evidence is clearly lacking, therefore *C. glycerion* is not included in the list as present in Albania but it is a potential species at the southern limit of its distribution in the Balkan peninsula.

Coenonympha leander (Esper, 1784)

The first citations of *C. leander* from two localities in SE Albania come from Rebel & Zerny (1931). Misja & Kurrizi (1983), Misja (1993), van Swaay & Warren (1999), Misja (2005) and Verovnik & Popović (2013b) all listed the species but very few localities are given. On 10.viii.2017, VVE1 collected 1 worn ♂ of *C. leander* in the Vau i Çajës, north of Mali i Korabit. The species is probably more wide spread than currently known (S4 map 40). Research focusing on its earlier occurrence is needed to gain better insight into its current distribution in Albania.

Coenonympha tullia (Müller, 1764) and ***C. typhon*** Dyar, 1902

All citations and data concerning *C. typhon* or *C. tullia* have been included in *C. rhodopensis* (Elwes, 1900) and both the former are listed with status 0.

Erebia pandrose (Borkhausen, 1788)

Only Rebel & Zerny (1931), Popescu-Gorj (1971) and Misja (2005) provided locality data for *E. pandrose* in Albania. Misja & Kurrizi (1984), Misja (1993), van Swaay &

Warren (1999) and Verovnik & Popović (2013b) listed the species. VVE1 collected a single very worn specimen on 05.vii.2017 above Çerem towards Dobërdol (S4 map 65). *E. pandrose* is probably more widespread in the northern half of Albania but, as it is an early emerging *Erebia* from higher altitudes, targeted surveys are needed to have better information about its real distribution in the country.



Fig. 9. Habitat of *E. triarius*, north of Vermosh, 1729 m, 28.vi.2017 (© SC).

Erebia triarius (de Prunner, 1798) (Fig. 9)

Concerning localities, the available information for *E. triarius* is very scarce and was provided by Rebel & Zerny (1931) and Popescu-Gorj (1971). Misja & Kurrizi (1984), Misja (1993), van Swaay & Warren (1999) and Verovnik & Popović (2013b) listed the species without details. On 30.vi.2017, VVE1 observed a few worn *E. triarius* north of Vermosh (S4 map 68) in a small rocky locality. In the southern Balkan it is a local species and it is actually not shown as present in the Balkans in the distribution Atlas by Kudrna *et al.* (2015) where it is cited in the short text. Micevski (2014) reported it as a new species for MAC. It looks mandatory to survey potential habitats starting already at the end of May to have better information on its real distribution in Albania. At the southernmost limit in the Balkan it is probably local despite the fact that suitable habitats are widespread in the N. Albanian Alps.

Erebia gorge (Hübner, 1804) (Fig. 10a–b)

Rebel (1917) described a new subspecies, *Erebia gorge albanica*, from Gropa Strelit in the N. Albanian Alps. Warren (1936) illustrated specimens from Mali i Tomorrit (S. Albania) and stated it is a remarkable race. The specimens discussed and illustrated by Warren (1936) were from an isolated mountain, Mali i Tomorrit in S. Albania and might show different external characters to *E. gorge albanica*. Warren (1936) stated: “so it would seem that *albanica* may occur throughout the mountains of Albania, and very probably in the Voio Mountains in Macedonia also”. Therefore, VVE1 collected males and

females in five different localities (S4 map 59) and made a direct comparison of the collected specimens from these localities with specimens collected in 2013 by Cuvelier and Mølgaard on the summit of Mali i Tomorrit. The material shows important variability within a single locality in the size of the ocelli and the width of the orange band, but there is no obvious difference between populations from the N. Albanian Alps and Mali i Tomorrit in S. Albania. There are many, remote suitable habitats in the N. Albanian Alps and *E. gorge* is probably widespread in that area.

Erebia rhodopensis Nicholl, 1900 and ***Erebia aethiopellus*** (Hoffmannsegg, 1806)

Misja & Kurrizi (1984) listed “*Erebia aethiopella* Hffmgg” from the publication by Rebel & Zerny (1931) where *E. rhodopensis* was mentioned for Mt. Kobilica, now on the border between MAC and RKS. Misja (1993) cited “*E. aethiopella*” without details. *E. rhodopensis* was confirmed by Verovnik (2013a) on the Albanian side of Mali i Gramozit. *E. aethiopella* is a western alpine species and is given status 0 in the list.

Erebia cassioides (Reiner & Hochenwarth, 1792), ***E. tyndarus*** (Esper, 1781) and ***E. arvernensis*** Oberthür, 1908

E. tyndarus and *E. arvernensis* are western European species that were cited in different publications. They are listed with status 0 and referred to *E. cassioides*. *Erebia tyndarus balcanica* is referred to *Erebia ottomana* (Herrich-Schäffer, 1847).

Hipparchia fagi (Scopoli, 1763) and ***H. syriaca*** (Staudinger, 1871)

Information on these species is rather puzzling because *H. fagi*, *H. syriaca*, *H. alcyone* (Denis & Schiffermüller, 1775) and *H. hermione* (Linnaeus, 1764) have been cited. This can partly be explained by a longlasting taxonomical confusion in this group of morphologically similar butterflies. Rebel & Zerny (1931) studied the Jullien's organs without dissection to have reliable identifications for the available males. The females were assigned based on external characters to either *H. fagi* or *H. syriaca* even when knowing that this was not very reliable. Moucha (1963) only mentioned *H. fagi*. Murrain (1972) was the first to cite *Satyrus hermione* and *Pararge alcyone* and both are figured in that study. Misja & Kurrizi (1984) included *H. alcyone* and *H. fagi*. Gaskin (1990) only cited the observation of *H. syriaca*. Misja (1993) included *H. fagi* and *H. syriaca*. Beshkov (1995b) and Abadjiev & Beshkov (1996b) mentioned observations of *H. syriaca* that were documented by the dissection of the genitalia. In van Swaay & Warren (1999) and Misja (2005) *H. alcyone* and *H. fagi* were listed. Striniki-Laçey (2008) and Striniki-Laçey

& Misja (2013) only mentioned *H. alcyone*. Verovnik & Popović (2013b) correctly stated that *H. syriaca* was incorrectly listed in earlier publications as *H. alcyone* or *H. hermione*. In Šašić *et al.* (2015) *H. syriaca* and *H. fagi* were cited and Micevski *et al.* (2015) provided more evidence for the presence of *H. syriaca*. Abdomens of all the collected male specimens of VVE1 and VVE2 were brushed for the observation of the Jullien organs. From most of the localities we confirmed only *H. fagi*. *H. syriaca* was identified from five localities: Cernjevë, Llugaj, Qafmollë, Shën Mëri and Vlad. It looks tempting to refer the cited *H. hermione* and *H. alcyone* to *H. syriaca*, often smaller than *H. fagi*, but this remains subjective. Therefore, the map (S4) of *H. syriaca* provides information about the taxon cited in the original publication and needs to be interpreted with caution. Some citations of *H. fagi* as well, are not based on confirmed specimens after dissection of the genitalia. The same caution is needed for the interpretation of its map. *H. fagi* and *H. syriaca* are both listed for Albania. *H. hermione* and *H. alcyone* have status 0 in the checklist. We advocate to do more research and to publish only observations confirmed by the dissection of the genitalia.



Fig. 10a. Habitat of *Erebia gorge*, Mali i Korabit, 2339 m, 7.vii.2017 (© SC).

Fig. 10b. *Erebia gorge* ♂, Mali i Korabit, 2339 m, 7.vii.2017 (© JC).

Hipparchia semele (Linnaeus, 1758), ***H. senthes*** (Frühstorfer, 1908) and ***H. volgensis*** (Mazochin-Porshnjakov, 1952) (Fig. 11)

For this *Hipparchia* group the data are at least as puzzling as in the previous case and do not provide a correct knowledge of the actual distribution of these taxa in Albania. Rebel & Zerny (1931) quoted only *H. semele* but mentioned similarities with the races "*appeninigena* Verity" and "*senthes* Frühstorfer". In 1983, Coutsis mentioned one ♀ *H. semele* from Jablanica and figures one ♂ from the same locality. Moucha (1963) listed *Satyrus semele* and Misja & Kurrizi (1984) mentioned *H. semele*. Gaskin (1990) collected a single *Hipparchia* and quoted that Coutsis suggested it could be either *H. volgensis* or *H. senthes*. Misja (1993) listed *H. semele* adding: "(?=*H. aristaeus*, *H. volgensis*)". Beshkov (1995b) was the first to provide strong evidence for *H. volgensis* with two dissected specimens.

Abadjiev & Beshkov (1996b) confirmed *H. senthes* but no proof was provided. Van Swaay & Warren (1999) and Misja (2005) only listed *H. semele*. Verovnik & Popović (2013b) listed *H. volgensis*, *H. semele* and *H. senthes* and added that the presence of *H. semele* in the northwestern part of Albania needs to be checked. Šašić *et al.* (2015) mentioned *H. senthes* from SE Albania while Micevski *et*

al. (2015) cited also *H. volgensis* from that area. Genitalia were prepared for all the collected specimens.



Fig. 11. *Hipparchia semele* ♂ genitalia, N. Vermosh, 1609 m, 28.vi.2017, coll. SC (© SC).

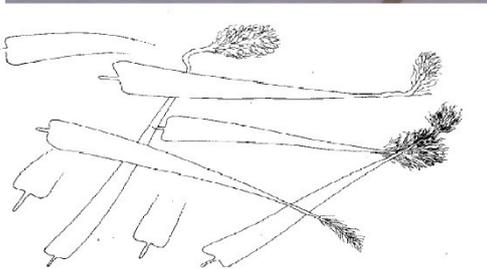
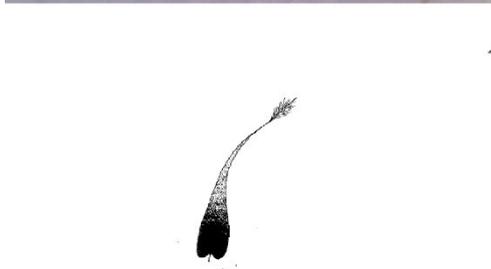
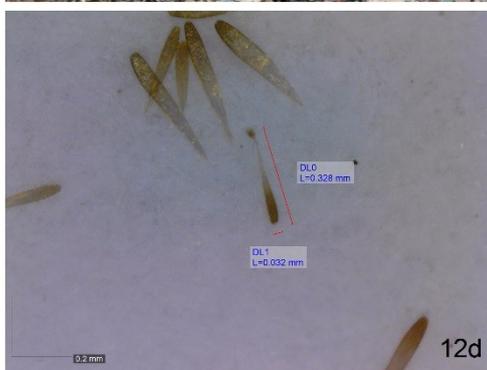
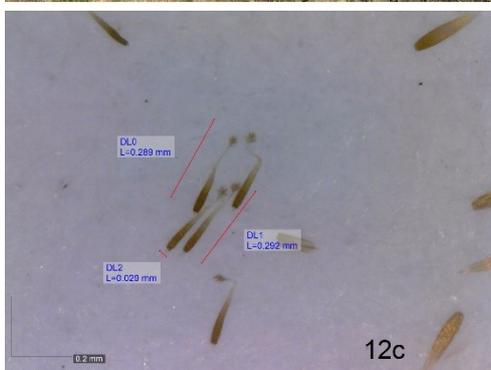
H. semele is now confirmed for the northwestern Albanian Alps where it was found in two localities near Vermosh. In sympatry also one male *H. volgensis* was found north of Vermosh and two males were collected on Mali i Koritnikut. The maps (S4) are using the names cited in the original publications and must be interpreted with

caution. We advocate to do more research and to publish only observations after genitalia dissection has confirmed the correct identification.

Kirinia climene (Esper, 1783)

The only detailed citation for Albania is old (Rebel & Zerny 1931): a single worn female collected near Kruma. It has since then been listed in Misja & Kurrizi (1984), Misja (1993), van Swaay & Warren (1999), Misja (2005) and Verovnik & Popović (2013b) but no new observations

were provided. *K. climene* has been cited from MAC (Krpač *et al.* 2011, Krpač & Darcemont 2012) where it is on the red list. It is also present nearby Albania in northwestern Greece (Pamperis 2009). Habitats of *K. climene* are under pressure due to increasing grazing and deforestation and this is clearly a threat in potential areas in Albania. It is urgent to confirm the presence of *K. climene* and therefore it is given a DD status.



12e

Fig. 3. Les androconiens de *Pseudochazara graeca*.

Fig. 4. Les androconiens de *Pseudochazara cingovskii*.

Fig. 12a. Habitat of *Pseudochazara tisiphone*, Bulqizë, 1617 m, 13.vii.2017 (© SC).

Fig. 12b. *Pseudochazara tisiphone* ♂, Bulqizë, 1617 m, 18.vii.2017 (© LP).

Fig. 12c–d. Androconial scales of *Pseudochazara tisiphone*, Bulqizë, 1617 m, 13.vii.2017 (© SC).

Fig. 12e. Androconial scales of the two *Pseudochazara* species as published in Misja (1993).

Pseudochazara tisiphone Brown, 1980 and ***P. amymone*** Brown, 1976 (Figs 12a–e, 13, Plate 1)

Since the descriptions of some new *Pseudochazara* species from the southern Balkan by Gross (1978), Brown (1976, 1980), taxonomical changes have created a lot of confusion resulting in a puzzle for Albania including the following names: *Pseudochazara mamurra* (Herrich-Schäffer, 1846), *P. cingovskii* (Gross, 1973), *P. graeca* (Staudinger, 1870), *P. mniszechii tisiphone* Brown, 1980, *P. tisiphone*, *P. mamurra amymone* Brown, 1976 and *P. amymone*. It is important to remember that *tisiphone* was described originally by Brown in 1980 as a subspecies of *P. cingovskii* and since the article by Wakeham-Dawson (1997) this taxon was often cited as subspecies *P. mniszechii tisiphone*. Takáts & Mølgaard (2016) and Verovnik & Wiemers (2016) used DNA barcoding to give

answers on the taxonomical status of the described *Pseudochazara* species and to provide information on the phylogeny of this genus. We will follow the proposal from Verovnik & Wiemers (2016) and use separate species status for *P. tisiphone* and *P. amymone*. On top of this confusion, there was additionally the lack of awareness of local publications (Misja & Kurrizi 1984, Misja 1993, Misja 2005) that were not consulted in the preparation of some recent publications and lists. First, *P. mamurra* was reported by Misja & Kurrizi (1984). In 1993, Misja recorded two new *Pseudochazara* for Albania and based on the androconial scales and genitalia he identified them as *P. cingovskii* and *P. graeca*. However, in the list of van Swaay & Warren (1999) and in the Atlas of Misja (2005), only one species was retained: *P. cingovskii*. In 2012, Eckweiler recorded two new *Pseudochazara* for Albania,

P. mamurra amygone and *P. mniszeczhii tisiphone* and none of these historical publications (Misja & Kurrizi 1984, Misja 1993, Misja 2005) were cited. Shortly after, different publications (Verovnik *et al.* 2014, Gascoigne-Pees *et al.* 2014, Cuvelier & Mølgaard 2015, Šašić *et al.* 2015) brought more evidence and details adding further proof that, at that time, some of the initial publications were not available. To elucidate the early findings by Misja (1993, 2005) the collection in the Natural Sciences Museum of Albania in Tiranë was controlled but not a single specimen

of such a *Pseudochazara* was found. Unfortunately, it looks possible that the original material was destroyed by insufficient care to the collection. It is only indirectly that we can hypothesize on what *Pseudochazara* taxa had been recorded. A comparison between the drawings of the androconial scales of the two taxa in Misja (1993) with the photographs in Cuvelier & Mølgaard (2015) and the figures in Gross (1978) is suggestive for *P. tisiphone* (*P. cingovskii* in the publication) and for *P. amygone* (*P. graeca* in the publication).



Fig. 13. Habitat of *Pseudochazara tisiphone*, Krastë, 1350–1480 m, 19.vii.2017 (© LP).

On 13.vii.2017, VVE1 discovered good populations of *P. tisiphone* around Bulqizë (Dibër county). This is an important extension of its distribution, some 100 km north of Korçë county. *P. tisiphone* was present in stony habitats on ophiolite substrate, very similar to the known localities nearby Korçë. On 18.vii.2017, not aware of these findings, VVE2 also observed *P. tisiphone* in the same area and nearby Krastë (S4 map 171). External characters and androconial scales, extracted from the wing of one specimen from Bulqizë, are similar to the previously studied specimens (Cuvelier & Mølgaard 2015) from southeastern Albania. DNA barcoding confirmed the identification (oral communication Vila & Dincă). It is expected that other populations can be found between Korçë and around Bulqizë and identical habitats are even present north of Bulqizë. The Bulqizë area is maybe at the limit of the climatic requirements of *P. tisiphone*. Despite a focused field research as well for *P. amygone*, this species was not found but as it is much more local it is not excluded that it can be found between the county of Korçë and the area around Bulqizë. More research is clearly needed to elucidate the complete distribution of *P. tisiphone* and *P. amygone* in Albania.

Satyrus ferula (Fabricius, 1793) and ***Satyrus actaea*** (Esper, 1781)

Rebel & Zerny (1931) gave different localities for *S. ferula* in Albania. Finding it published (Misja & Kurrizi 1984) together with *S. actaea*, a southwestern European species, is surprising. In this publication *S. actaea* was

cited from different Albanian localities and mentioned as personal material of the authors. In 1993, Misja again listed both species but adds a short quote: “*Satyrus actaea* Esp. (?=*S. ferula*)”. Both species were listed in van Swaay & Warren (1999) and Misja (2005). Verovnik & Popović (2013b) did not include *S. actaea*. All *Satyrus* specimens in the Natural Sciences Museum of Albania in Tiranë were controlled and only *S. ferula* was found. The observations of *S. actaea* from literature are referred to *S. ferula* and *S. actaea* has status 0.

Updated checklist of the Albanian butterflies

Taking into account all the above mentioned information, we present a new checklist for the Albanian butterflies. It is too early to comment on the conservation status of many butterfly species in Albania. As a consequence, there is no application of the IUCN Red List Criteria at Albanian level. Much more evidence is needed as has been shown in the notes. It will be difficult to compare more intensive, future surveying with former decades as the historical data on the distribution of many species are clearly insufficient. In the checklist four symbols (1, DD, P, 0) for the status are used giving the level of evidence.

In the supplementary material (S4) distribution maps for all species with evidence (1 and DD) are included. They combine the data from old publications, recent surveys and unpublished material.

Table 1. Updated checklist of the Albanian butterflies

Hesperiidae	Status	<i>Colias alfacaeniensis</i>	1	<i>Polyommatus escheri</i>	1	<i>Hipparchia alcyone</i>	0
<i>Pyrrhus malvae</i>	1	<i>Colias croceus</i>	1	<i>Polyommatus amandus</i>	1	<i>Hipparchia syriaca</i>	1
<i>Pyrgus alveus</i>	1	<i>Colias caucasica</i>	1	<i>Polyommatus thersites</i>	1	<i>Hipparchia fagi</i>	1
<i>Pyrgus andromedae</i>	1	<i>Gonepteryx rhamni</i>	1	<i>Polyommatus dorylas</i>	1	<i>Hipparchia hermione</i>	0
<i>Pyrgus armoricanus</i>	1	<i>Gonepteryx cleopatra</i>	1	<i>Polyommatus daphnis</i>	1	<i>Hipparchia volgensis</i>	1
<i>Pyrgus bellieri</i>	0	<i>Gonepteryx farinosa</i>	1	<i>Polyommatus icarus</i>	1	<i>Hipparchia semele</i>	1
<i>Pyrgus serratulae</i>	1	<i>Leptidea sinapis</i>	1	<i>Polyommatus eroides</i>	0	<i>Hipparchia senthes</i>	1
<i>Pyrgus cinarae</i>	1	<i>Leptidea juvernica</i>	1	<i>Polyommatus eros</i>	1	<i>Hipparchia fatua</i>	1
<i>Pyrgus sidae</i>	1	<i>Leptidea duponcheli</i>	1	<i>Lysandra coridon</i>	1	<i>Hipparchia statilinus</i>	1
<i>Pyrgus carthami</i>	1			<i>Lysandra bellargus</i>	1	<i>Chazara briseis</i>	1
<i>Spialia sertorius</i>	0	Riodinidae				<i>Pseudochazara geyeri</i>	1
<i>Spialia orbifer</i>	1	<i>Hamearis lucina</i>	1	Nymphalidae		<i>Pseudochazara anthelea</i>	1
<i>Spialia phlomidis</i>	1			<i>Libythea celtis</i>	1	<i>Pseudochazara cingovskii</i>	0
<i>Muschampia proto</i>	1	Lycaenidae		<i>Danaus chrysippus</i>	1	<i>Pseudochazara graeca</i>	0
<i>Muschampia tessellum</i>	P	<i>Thecla betulae</i>	1	<i>Charaxes jasius</i>	1	<i>Pseudochazara tisiophone</i>	1
<i>Carcharodus alceae</i>	1	<i>Favonius quercus</i>	1	<i>Apatura iris</i>	1	<i>Pseudochazara mamurra</i>	0
<i>Carcharodus lavatherae</i>	1	<i>Satyrium acaciae</i>	1	<i>Apatura ilia</i>	1	<i>Pseudochazara amydone</i>	1
<i>Carcharodus floccifera</i>	1	<i>Satyrium ilicis</i>	1	<i>Apatura metis</i>	1	<i>Satyrus ferula</i>	1
<i>Carcharodus orientalis</i>	1	<i>Satyrium spini</i>	1	<i>Limenitis camilla</i>	P	<i>Satyrus actaea</i>	0
<i>Carcharodus baeticus</i>	0	<i>Satyrium w-album</i>	1	<i>Limenitis reducta</i>	1	<i>Minois dryas</i>	1
<i>Erynnis tages</i>	1	<i>Satyrium pruni</i>	P	<i>Neptis rivularis</i>	DD	<i>Brintesia circe</i>	1
<i>Erynnis marloyi</i>	1	<i>Callophrys rubi</i>	1	<i>Araschnia levana</i>	P	<i>Arethusana arethusia</i>	1
<i>Carterocephalus palaemon</i>	1	<i>Lycaena phlaeas</i>	1	<i>Nymphalis antiopa</i>	1	<i>Erebia ligea</i>	1
<i>Heteropterus morpheus</i>	0	<i>Lycaena dispar</i>	1	<i>Nymphalis polychloros</i>	1	<i>Erebia euryale</i>	1
<i>Thymelicus acteon</i>	1	<i>Lycaena virgaureae</i>	1	<i>Nymphalis xanthomelas</i>	1	<i>Erebia epipliron</i>	1
<i>Thymelicus lineola</i>	1	<i>Lycaena ottomanus</i>	1	<i>Nymphalis vaualbum</i>	P	<i>Erebia aethiops</i>	1
<i>Thymelicus sylvestris</i>	1	<i>Lycaena tityrus</i>	1	<i>Aglais io</i>	1	<i>Erebia triarius</i>	1
<i>Hesperia comma</i>	1	<i>Lycaena alciphron</i>	1	<i>Aglais urticae</i>	1	<i>Erebia medusa</i>	1
<i>Ochlodes sylvanus</i>	1	<i>Lycaena thersamon</i>	1	<i>Vanessa atalanta</i>	1	<i>Erebia gorge</i>	1
<i>Gegenes nostrodamus</i>	1	<i>Lycaena hippothoe</i>	0	<i>Vanessa cardui</i>	1	<i>Erebia aethiopoulos</i>	0
<i>Gegenes pumilio</i>	1	<i>Lycaena candens</i>	1	<i>Issoria lathonia</i>	1	<i>Erebia rhodopensis</i>	1
		<i>Lampides boeticus</i>	1	<i>Polygonia c-album</i>	1	<i>Erebia tyndarus</i>	0
Papilionidae		<i>Leptotes pirthous</i>	1	<i>Polygonia egea</i>	1	<i>Erebia cassioides</i>	1
<i>Papilio machaon</i>	1	<i>Cacyreus marshalli</i>	1	<i>Argynnis pandora</i>	1	<i>Erebia arvernensis</i>	0
<i>Papilio alexanor</i>	1	<i>Tarucus balkanicus</i>	1	<i>Argynnis paphia</i>	1	<i>Erebia ottomana</i>	1
<i>Iphiclidus podalirius</i>	1	<i>Tarucus theophrastus</i>	0	<i>Argynnis aglaja</i>	1	<i>Erebia pronoe</i>	1
<i>Zerynthia cerisy</i>	1	<i>Cupido argiades</i>	1	<i>Argynnis adippe</i>	1	<i>Erebia melas</i>	1
<i>Zerynthia polyxena</i>	1	<i>Cupido alcetas</i>	1	<i>Argynnis niobe</i>	1	<i>Erebia oeme</i>	1
<i>Parnassius apollo</i>	1	<i>Cupido decolorata</i>	1	<i>Brenthis hecate</i>	1	<i>Erebia pandrose</i>	1
<i>Parnassius mnemosyne</i>	1	<i>Cupido minimus</i>	1	<i>Brenthis daphne</i>	1	<i>Maniola jurtina</i>	1
		<i>Cupido osiris</i>	1	<i>Brenthis ino</i>	1	<i>Hyponephele lycaon</i>	1
Pieridae		<i>Celastrina argiolus</i>	1	<i>Boloria pales</i>	1	<i>Hyponephele lupinus</i>	1
<i>Aporia crataegi</i>	1	<i>Glaucopteryx alexis</i>	1	<i>Boloria graeca</i>	1	<i>Aphantopus hyperantus</i>	1
<i>Pieris brassicae</i>	1	<i>Phengaris alcon</i>	1	<i>Boloria tania</i>	1	<i>Pyronia tithonus</i>	1
<i>Pieris rapae</i>	1	<i>Phengaris arion</i>	1	<i>Boloria euphrosyne</i>	1	<i>Pyronia cecilia</i>	1
<i>Pieris mannii</i>	1	<i>Iolana iolas</i>	1	<i>Boloria dia</i>	1	<i>Coenonympha tullia</i>	0
<i>Pieris ergane</i>	1	<i>Scolitantides orion</i>	1	<i>Melitaea cinxia</i>	1	<i>Coenonympha typhon</i>	0
<i>Pieris balcana</i>	1	<i>Pseudophilotes vicrama</i>	1	<i>Melitaea phoebe</i>	1	<i>Coenonympha rhodopensis</i>	1
<i>Pieris napi</i>	1	<i>Kretania sephirus</i>	1	<i>Melitaea ornata</i>	1	<i>Coenonympha pamphilus</i>	1
<i>Pieris krueperi</i>	1	<i>Plebejus argyrognomon</i>	1	<i>Melitaea didyma</i>	1	<i>Coenonympha arcania</i>	1
<i>Pontia daplidice</i>	0	<i>Plebejus argus</i>	1	<i>Melitaea vivia</i>	1	<i>Coenonympha gardetta</i>	0
<i>Pontia edusa</i>	1	<i>Plebejus idas</i>	1	<i>Melitaea athalia</i>	1	<i>Coenonympha orientalis</i>	1
<i>Pontia chloridice</i>	DD	<i>Eumedonia eumedon</i>	1	<i>Melitaea diamina</i>	1	<i>Coenonympha leander</i>	1
<i>Euchloe ausonia</i>	1	<i>Aricia agestis</i>	1	<i>Melitaea aurelia</i>	P	<i>Coenonympha glycerion</i>	P
<i>Euchloe penia</i>	1	<i>Aricia artaxerxes</i>	1	<i>Euphydryas maturna</i>	DD	<i>Pararge aegeria</i>	1
<i>Anthocharis cardamines</i>	1	<i>Aricia anteros</i>	1	<i>Euphydryas aurinia</i>	1	<i>Lasiommata megera</i>	1
<i>Anthocharis gruneri</i>	1	<i>Cyaniris semiargus</i>	1	<i>Melanargia galathea</i>	1	<i>Lasiommata petropolitana</i>	1
<i>Anthocharis damone</i>	1	<i>Polyommatus damon</i>	1	<i>Melanargia lachesis</i>	0	<i>Lasiommata maera</i>	1
<i>Colias aurorina</i>	1	<i>Polyommatus ripartii</i>	1	<i>Melanargia russiae</i>	1	<i>Kirinina roxelana</i>	1
<i>Colias hyale</i>	0	<i>Polyommatus admetus</i>	1	<i>Melanargia larissa</i>	1	<i>Kirinina climene</i>	DD

Plate 1



Plate 1. Figs 1–2. *Pyrgus andromedae* ♀ (upper- & underside), Malet i Koritnikut, 2348 m, 8.vii.2017; Figs 3–4. *Leptidea juvernica* ♂ (upper- & underside), Çerem, 1556 m, 5.vii.2017; Figs 5–6. *Colias caucasica* ♂ (upper- and underside), Figs 7–8. *Colias caucasica* ♀ (upper- & underside), Vau i Çajës, 1588 m, 12.vii.2017; Figs 9–10. *Boloria titania* ♂ (upper- & underside); Figs 11–12. *Boloria titania* ♀ (upper- & underside), Çerem, 1556 m, 5.vii.2017; Figs 13–14. *Pseudochazara tisiphone* ♂ (upper- & underside), Bulqizë, 1617 m, 13.vii.2017; Figs 15–16. *Pseudochazara tisiphone* ♀ (upper- & underside), Krastë, 1484 m, 19.vii.2017 (all specimens in figs 1–14 coll. SC, © SC, specimens in figs 15–16 coll. LP, © LP).

Conclusion

With only two surveys that targeted less explored areas of Albania, and in one single period of the year, from the end of June to the end of July, it was possible to find four new species for the current Albanian territory, to bring evidence for two data deficient species and to add a considerable amount of new data concerning the distribution of many species. A focus has been given towards future research by listing potential species to discover as new for Albania and that are confirmed from the neighbouring countries. It is not impossible that *Argiades dardanus* (Freyer, 1844) can be found in the N. Albanian Alps where *Androsace villosa* was seen by VVE1, *Pseudophilotes bavius* (Eversmann, 1832) and *Argiades optilete* (Knoch, 1781) might be discovered in the Northeast of Albania.

We hope that this study will stimulate entomologists to perform more intensive research and surveys in different months and areas of Albania. Taking into consideration the list of potential species without evidence for the moment, there is no doubt that more species will be added to the list. On top of that it surely is possible to contribute to a much better knowledge about the distribution of the Albanian butterflies. From the actual limited data and own experiences, it is obvious that

many threatened species at European level have strong populations in Albania. From a conservation perspective it is urgent to preserve their Albanian habitats and to manage them optimally because since the end of its historical isolation, Albania is working hard to become a modern country. Past experiences of countries joining the EU gave too many examples that this often was dramatic for important populations of local and rare species. Such changes have potentially drastic consequences on the agropastoral ancestral management that in the country is still widespread in many remote areas. Important road works have started having a big impact on the environment and increase the human pressure in the neighbourhood as is already visible with new motorways and dust roads that are being asphalted and bordered with concrete over long distances. Hydroelectrical powerplants produce green energy but destroy vast areas that are the habitat of species, typical of the valleys. It is to be hoped, without being naive, that Europe has learned its lesson from the massive losses that globalisation has created on biodiversity and that this will not be repeated again in Albania. Many Albanian places are spectacular and the slowly developing agritourism could be one of the ways to go as well for the local economy as for the preservation of the beautiful nature and its butterflies.

Acknowledgements

We thank Prof. Kastriot Misja for comments on the historical data, Morten Mølgaard for preparing the coordinates of the locality data from the historical publications, Vlad Dincă for reviewing the final draft, Roger Vila and Vlad Dincă for the DNA barcoding analysis, Cecilia Corbella i Felip for processing the samples, Thomas Maertens and Delphine Vincke for the fieldwork in the VVE2 team, Enilda Rrapaj for giving assistance to VVE2, Peter Russell for the language corrections, Pieter Vantieghem and Thomas Maertens for providing unpublished observations, Milan Đurić for providing literature, Willy De Prins for comments on historical quotes and for editing the publication and Theo Garrovoet for comments on historical quotes. H. Ziegler receives our

gratitude for the visual analysis of the collected specimens of the *Pieris napi/balcana* complex. We are grateful to the Ministry of the Environment, Republic of Albania for providing a permit for this research. Last but not least we also thank Ortwin Hoffmann, Dave Maertens, Raphael Windey, Philippe Van de Velde and Agnes Van Grimberge (members of the VVE Workgroup Butterflies). They helped with the numerous dissections that were finalized in three full day workshops.

Supplementary material

- S1: overview of the literature analysis.
- S2: results of the two surveys.
- S3: localities of the two surveys.
- S4: distribution maps for all species.

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