On the distribution, ecology and conservation status of *Brenthis ino* (ROTTEMBURG, 1775) and *Kirinia climene* (ESPER, [1783]) in Bulgaria (*Lepidoptera: Nymphalidae*)

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Summary

The discovery of large populations of *Brenthis ino* (ROTTEMBURG, 1775) and *Kirinia climene* (ESPER, [1783]) in the upper parts of the Sinite Kamûni massif in central-eastern Bulgaria is reported. The population of *B. ino*, the largest ever found in the country, is ecologically of high interest as it inhabits xerotherrnic rocky environments very dissimilar from the damp habitats normally preferred by the species. The discovery of *K. climene* in the vicinity of Sliven at long last corroborates a hitherto "doubtful" record from 1896 of *climene* from "Sliven". Provided is a list of other butterfly and skipper species, most of them markedly xerophilous, that are found in this highly interesting habitat. In addition, the most recent finding of *K. climene* in Bulgaria, from Gorna Banya, a suburb of Sofia, is reported.

Résumé

L'auteur rapporte la découverte d'importantes populations de *Brenthis ino* (ROTTEMBURG, 1775) et de *Kirinia climene* (ESPER, [1783]) dans le massif de Sinite Kamûni au centre est de la Bulgarie. La population de *B. ino*, la plus dense jamais trouvée dans le pays, est d'un intérêt écologique majeur car elle est installée dans un habitat rocheux xérothermique, très différent des biotopes humides que l'espèce semble préférer ailleurs. La population de *K. climene* constitue la troisième confirmée pour la Bulgarie et sa découverte confirme sa présence dans les environs de la ville de Sliven en 1896. Une liste du cortege lépidoptérologique, xérophile pour la majorité des éléments, dans cet habitat très intéressant, est produite.

Key-words - Mots clés : *Lepidoptera, Nymphalidae, Brenthis ino* (ROTTEMBURG, 1775), *Kirinia climene* (ESPER, 1783), Bulgaria, distribution, ecology.

Distribution and habitat preferences of *Brenthis ino* (ROTTEMBURG, 1775)

*Brenthis ino* is widespread from northern Spain across most of northern, central and eastern Europe, temperate Asia to the Kuril Islands and Japan. It is typically associated with wet meadows, marshland, hillside bogs and damp flowery places near rivers etc. (TOLMAN & LEWINGTON, 1997). The habitat niche of this hygrophilous species is similar in places as diverse as Spain (M. MUNGUIA, in litt.), Switzerland (LSPN, 1987), Finland (MARTIILA et al., 1992), Poland (BUSZKO & MASŁOWSKI, 1993) and Turkey (HESSELBARTH et al., 1995). Rare exceptions to its hygrophily are also known: an example is a population in Switzerland (Chasseral) which inhabits dry glades in spruce forest and uses a different host-plant (*Sanguisorba minor*) than the wetland populations in the same country, feeding on *Filipendula ulmaria* (LSPN, 1987).

As elsewhere at its southern distribution limit in Europe, *Brenthis ino* is very local and generally rare in the Balkans. Widely isolated colonies have been reported from the northern and central part of the Peninsula : Slovenia, Croatia, Bosnia-Hercegovina, Yugoslavia (Serbia), Republic of Macedonia (JAKŠIĆ, 1988), Albania (THURNER, 1964) and Bulgaria. We are unaware of records from the Greek or Turkish territory on the Balkan Peninsula.

Most of the published Bulgarian data on *B. ino* originate from the mountains of southern and central Bulgaria and their foothills. There are three records from the Rila Mts and their northern foothills: the town of Kostenets (NRC, 1900), the valley of Rilska river above Rilski Manastir (ELWES, 1900), and the village of Dolna Banya (GANEV, 1983a). A single record exists from the Rhodopi Mts : near the town of Velingrad (MARKOVITCH, 1923). Two localities have been reported from the eastern part of the Stara Planina Mts : Byala village (REBEL, 1903) and Kotel pass (ABADJIEV, 1995 citing pers. comm. by R. ESSAYAN). Finally, two sites in the coastal regions of southeastern Bulgaria have been reported : the environs

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of Burgas (Buresch & Tuleschkow, 1929) and Kondolovo village in the Strandzha Mts (Krzywcki, 1981). The locality Dyulevo in the Sredna Gora range in central Bulgaria (Dirmanow & Schikrenow, 1962) is in need of confirmation (Abadjiev, 1995) and is not included here. In each of these places the species was noted only once and, invariably, on the basis of one or very few specimens.

The habitat preferences of Brenthis ino in the country have not been studied in detail so far. Buresch & Tuleschkow (1929), in a review of the Bulgarian records of B. ino prior to 1929, wrote that B. ino "occurs at the sea coast (Burgas) as well as in mountains up to 1200 m (above Rilski Manasdir) but is very rare and found only in moist meadows]". Regrettably, the few recent records of this species from Bulgaria contain no ecological data.

Being listed from less than 10 localities, and with most records being more than 50 years old, Brenthis ino stands out as one of the rarest and most local butterfly species in Bulgaria. It was included in the Red List of Bulgarian Butterflies and Larger Moths as "vulnerable" (Ganev, 1985). However, the rarity of ino appears to be an impression created by the virtual lack of collecting in the kind of wet habitats that could host populations of the species, as such places are not popular with collectors in Bulgaria. On the other hand, the presence of ino in unusual habitats such as the one reported here (see below) may be overlooked for the simple reason that its occurrence there would not be expected and specimens seen on the wing may easily be confused with its relatives Brenthis daphne or B. hecate. An excellent proof of this being the case was provided by Roland Essayan who has informed me (R. Essayan, in litt.) that between 1990 and 2000 he discovered ino in 15(1) 10×10-km UTM squares in central and southeastern Bulgaria. These discoveries are to be published in a near future (R. Essayan, in prep.).

A newly discovered, ecologically unusual population of Brenthis ino

Since 1996 I have been studying the butterfly fauna of the Sinite Kamuni (meaning "The Blue Rocks") situated north of the town of Sliven. This massif, which is part of the eastern extremity of the Stara Planina mountain range, is 13 km long and at most 7 km wide, and covers an area of about 50 km² with a summit reaching 1181 m. Despite its small size and rather low altitude, Sinite Kamuni comprises an astonishing array of habitats ranging from xerothermic rocky slopes and screes on its south-facing foothills to mixed deciduous forests and montane meadows in its highest parts. Consequently, it harbours a very rich fauna of Papilionoidea and Hesperioidae exceeding 140 species.

On 30.VII.1998, while collecting in the upper parts of Sinite Kamuni at an altitude of 950 m, I captured three heavily worn Brenthis sp. that proved to be B. ino. This in itself was not surprising, since ino had been collected near Byala village (Rebel, 1903) situated on the foothills of the Stara Planina Mts only about 10 km to the west of this massif. Much more remarkable was the habitat in which the butterflies were flying, being a xerothermic rocky glade and therefore very different from what was known to me about this hygrophilous species. In order to find out whether this habitat indeed hosts a population of B. ino, I studied the locality in depth and the surrounding areas of the mountain the following year, from June to early August 1999. The species was first seen on 16.VI. when I found two freshly emerged ino examples, one of them with still unfolded wings, sitting on low vegetation in precisely the same place where the worn ones were collected the year before (Fig. 2). The following day, 17.VI. five more freshly emerged adults were observed in the same spot, flying among more than 20 equally fresh Brenthis hecate. By 29.VI. ino had become abundant and far outnumbered B. hecate and B. daphne: more than 30 ino ♀ ♂ were counted on that day against two daphne ♀ ♂ and in total 12 hecate ♀ ♂ and ♀ ♀. The first two freshly emerged ino ♀ ♀ were found on the following day, 30.VI. in the company of two ♀ ♂ about 300 m from the site where I had observed ino previously. By 18.VII. the flight of the ♀ ♂ had ended; only four more or less worn ♀ ♀ (Fig. 3) were recorded between 18.-20.VII. The flight of the ♀ ♀ too must have ended soon thereafter, as no ino were seen on my last visit on 3.VIII. It can be concluded from these observations that the newly discovered population of B. ino exhibits a marked protandry, the first ♀ ♀ appearing about two weeks after the first ♀ ♂.

My observations in 1999 fully confirm the exceptional habitat preferences of this population. It is restricted to a small area (approximately 500-150 m) near the steep, rocky southern rim of the plateau-like upper part of the massif, at an altitude of 950-1000 m. Along this rocky rim the extensive old deciduous forests dominated by Fagus × moesiaca and Quercus spp. constitute the characteristic vegetation of the upper part of the mountain, giving way to a patchwork of woodland and meadows. A few ino were recorded in microhabitats with
Published records of *Brenthis ino* in Bulgaria: 1: Rila, the valley of Rilska river above Rilski Manastir (ELWES, 1900); 2: Dolna Banya (GANEV, 1983a); 3: Kostenets (NICHOLL, 1900); 4: Velingrad (MARKOVITCH, 1923); 5: Byala village (REBEL, 1903); 6: Sinite Kamuni massif (present study); 7: Kotel pass (ABADJIEV, 1995 after pers. comm. by R. ESAYAN); 8: Burgas (BORESCH & TULESCHKOW, 1929); 9: Kondolovo village (KRZYwicki, 1981).

taller, denser vegetation. However, the majority – including, significantly, most ♀♂ and all freshly emerged ♀♂ – were observed on slightly sloping, south-facing xerothermic glades with sparser but very diverse “steppe-like” vegetation on locally exposed stony ground (Figs 1 and 4; see below for list of sympatric species). None of the habitats where ino was observed show any kind of surface moisture. The thin rocky soil has a very poor water-retention capacity, and any rain- or melt-water drains or evaporates rapidly. Besides, there are no other sources of surface moisture such as streams in the area where ino occurs. The fact that the species breeds in this habitat is proven beyond doubt by the observed emergence of ♀♂ therein. The high degree of adaptation to this exceptional environment is reflected in the observed numbers which indicate a thriving population – in fact, by far the largest recorded for ino in Bulgaria so far. Regrettably, oviposition was not observed and the larval host-plant of this population remains unknown. Although single cases of ino inhabiting dry sites are not unknown (see above), the population reported here provides what seems to be the most extreme example of such unexpected habitat preferences ever reported for this species.

**Distribution and habitat preferences of Kirinia climene (Esper, [1783])**

*Kirinia climene* is one of the rarest and least known butterfly species in Europe and Bulgaria. Apart from the southeastern part of European Russia, from where the species was described (Russia: the basin of Volga river), it has been recorded from Bulgaria, Romania, Serbia (Essayan & Jugan, 1993), the Republic of Macedonia (Thurner, 1964), Albania, Greece (Willemsen, 1977; Bretherton & Cribb, 1984; Pamperis, 1997), Moldavia and Ukraine (Hesselbarth et al., 1995, Tshikolovets, 2003). Besides this it occurs in Asia Minor (Hesselbarth et al., 1995), Caucasus, Transcaucasia (Nekrutenko, 1990, Tshikolovets, 2003) and Iran (Eckweiler & Hofmann, 1980), reaching the southern Zagros range. This dendrophilous species inhabits clearings in deciduous or mixed woodland, keeping close to the forest edge and being fond of resting in the forest canopy (Essayan & Jugan, 1993; Pamperis, 1997; Tolman & Lewington, 1997).

In a recent review of the European distribution of *K. climene*, Essayan & Jugan (1993) reported a newly discovered locality from Bulgaria. The authors repeatedly observed the species between 1990 and 1992 in the vicinity of Gorna Kremena village in northwestern Bulgaria, along the edge of a mixed deciduous forest at an altitude of about 400 m. This important discovery established beyond doubt the occurrence of *climene* in the country. The only previous record of this species from Bulgaria is from the vicinity of Sliven, where the butterfly was collected in 1896 by J. Haberhauser (Rebel, 1903). Buresch & Tuleschkow (1929) noted that no subsequent records of *climene* existed from Sliven even though this town and its environs were a popular collecting region during the first decades of the 20th century. These authors however confirmed that “[a single specimen [of *K. climene*] collected by Haberhauser but without date]” was preserved in the collection of the Royal Museum of Natural History in Sofia, and on the basis of this deemed the species “[extremely rare]” in the country (Buresch & Tuleschkow, 1929). *K. climene* remained undetected in the surroundings of Sliven despite repeated visits by lepidopterists, and Abadjiev (1993) considered it “probably extinct in the area near Sliven”. In the meantime I became aware of the fact that the collection of Haberhauser preserved at the National Museum of Natural History in Sofia contained specimens labelled “Sliven, coll. Haberhauser” that had doubtless been mislabelled. Such are e.g. *Plebeius orbitulus* (Prunner, 1798) and *Lycaena thetis* Klug, 1834 reported respectively by Ganev & Bocharov (1982) and Ganev (1983b) as new to Bulgaria on the basis of false data specimens. In reality neither of these species occurs near Sliven or indeed anywhere else in Bulgaria (Kolev, 2002). Therefore, there seemed to be a good reason to doubt whether Haberhauser’s *climene* was really collected near Sliven or, for that matter, in Bulgaria.

Following his first discovery of *climene* in Bulgaria, R. Essayan recently found this species in a second locality, this time in the southwest of the country. On 21.VII.1998, he observed 5 ♀♂ in the vicinity of *Quercus* trees on a hill between the villages Goranovtsi and Sushitsa, north of the town of Kyustendil (R. Essayan, in litt., 22.XII.2000).

In August 1999 I was able to examine the materials of *Papilionoidea* and *Hesperioidea* collected by Alexander Slivov during his work at the Institute of Zoology in Sofia and kept therein. Among these there is a single *climene* ♀ bearing the label “Balchik, 12.VII.[19]69, Slivov”. Balchik is a town at the northern Black Sea coast of Bulgaria. While the occurrence of *climene* there is entirely possible, in my opinion the presence of a population of the species in the environs of this town needs confirmation. This is due to the fact that the specimens collected by Slivov contain numer-
ous cases of clearly erroneous or highly dubious labelling and, while these are only a fraction of the collection's bulk, they inevitably cast doubt on much of the interesting data which it contains (KOLEV, 2002), including this example of *climene*.

**New records of *Kirinia climene* from Bulgaria**

In the course of my research on the afore-mentioned population of *Brenthis ino* in Sinite Kamůnů, in the afternoon of 30.VI.1999, I was observing individuals of *ino* near the forest edge (Fig. 1). From my vantage point I noted a butterfly looking like *Kirinia roxelana*, a species abundant all over the massif, which eventually alighted on a flower of *Filipendula* sp. some twenty metres away. At close range it proved to be a fresh *Kirinia climene* ♀. Recalling the dendrophilous habits of this species, I set out along the forest margin in search of more specimens. Within just a few minutes this resulted in the capture of four equally fresh *climene* ♂♂ sitting on the foliage of overhanging beech branches in a small shady clearing. My subsequent visits showed that *climene* was not uncommon in the high areas of Sinite Kamůnů along the margin of the *Fagus*-dominated woodland at altitudes of 950-1000 m (Fig. 5) as well as in adjacent flowery meadows often far away from the forest. Hence, on 18.VII. I counted 15 specimens, most worn ♂♂ but also a few ♀♀ in relatively good condition, nectaring on *Centaura* sp. inside a small area (ca. 200 m²) that was part of an extensive grassy meadow with sparse bushes and virtually no trees. On 20.VII. I recorded a ♀ basking on a sunlit cliff-top (a behaviour that I have not seen mentioned for *climene* before) about 300 m from the forest edge, and encountered further six specimens in bushy glades and meadows closer to the forest. The last specimen, a heavily worn ♀, was seen on 2.VIII. 1999.

I observed *climene* only in the highest parts of Sinite Kamůnů but, despite careful search, never in its lower foothills situated immediately outside the town of Sliven. The latter are markedly more xerothermic and harbour a somewhat different butterfly fauna. Therefore the locality "Sliven", as reported by all previous sources (REBEL, 1903; BURESCH & TULESCHEKOW, 1929; ABADJIEV, 1993, 2001; ESSAYAN & JUGAN, 1993), must be corrected to "Stara Planina range, Sinite Kamůnů massif north of Sliven, 950-1000 m".

It is remarkable that *K. climene*, being relatively widespread in the massif and not particularly rare, has avoided detection for more than a century in a region that is relatively well explored. This is probably explained by the inconspicuous appearance and habits of the species. According to my observations, in the morning or in intermittently cloudy weather both sexes of *climene* bask on sunlit foliage some 1.5-3 m above the ground (Fig. 7), but during the hottest hours of the day they retreat to shady places under trees and large bushes at the forest edge. There they rest on tree trunks, lower branches or foliage, as well as in the grass under the trees. In all these cases reflections of sunlight on the foliage, the contrasting pattern of mottled shade and the drab underside of *climene* make resting individuals difficult to spot unless they are scared into flight. However, even then as well as while feeding on flowers (Figs 6 and 8), which takes place mostly in mid- and late afternoon, at some distance *climene* can easily be confused with other similarly sized and coloured *Satyrinae*, e.g. the ubiquitous *Maniola jurtina* (pers. observ.).

After the first version of this manuscript was submitted for publication, I discovered yet another Bulgarian locality of *climene*. A moderately worn ♂ was collected on 7.VII.2003 in the parkland at the upper end of Gorna Banya suburb of Sofia, at an altitude of about 800 m. The specimen was observed for some time basking in mottled shade on dry bare ground inside a small grove of oak trees at the edge of the parkland.

**GANEV** (1985) listed *Kirinia climene* as "endangered" in Bulgaria. Rather than being threatened, or even particularly rare, there is every indication that this species, similarly to *Brenthis ino* (see above), is in fact significantly underreported. It probably has a wider distribution range in the deciduous forests of northern and western Bulgaria: its occurrence in the otherwise unremarkable deciduous woodland near Gorna Kremena (ESSAYAN & JUGAN, 1993) and Sofia (see above), both discovered by what amounts to pure chance, testifies to this possibility. The forest-edge habitats that this species prefers are likewise unattractive to collectors. Therefore it is to be expected that purposeful collecting that takes into account the secretive behaviour of *K. climene* will reveal numerous further localities of this species in the country.

**Sympatric species**

The habitat of *B. ino* and *K. climene* in Sinite Kamůnů harbours a diverse fauna of *Papilionoidea* and *Hesperioidea*, which is a unique mix of ubiquist, xerotherphilous, xeromontane, "steppe" and montane species. So far I have discovered there no less than 93 spp., and I have not yet had an opportunity to examine the spring fauna.
This locality ranks among the most diverse in Bulgaria.

Amongst the species that I encountered there are many that are restricted mostly or exclusively to xerothermic rocky terrain at low to middle altitudes. In this habitat they occur at or near the uppermost limit of their distribution in Bulgaria, and their presence here underscores its xerotherrnic character. A list of these species (asterisked) as well as some other xerophilous butterflies characteristic of this habitat are listed below.

*Pyrgus armoricanus* (OBERTHÜR, 1910)
*Pyrgus cinaereae* (RAMBIUR, [1839])
*Pyrgus sidae* (ESPER, [1784])
*Hesperia comma* (LINNAEUS, 1758)
*Pieris manni* (MAYER, 1851)
*Pieris krueperi* STAUDINGER, 1860
*Colias alfacariensis* RIBBE, 1905
*Lycaena thersamon* (ESPER, [1784])
*Lampides boeticus* (LINNAEUS, 1767)
*Pseudophilotes vicrama* (RAMBUR, [1839])
*Plebeius sephenius* (FRIVALDSKY, 1835)
*Aricia anteros* (FREYER, [1838])
*Polymatamas eroides* (FRIVALDSKY, 1835)
*Polymatamas admetus* (ESPER, [1783])
*Polymatamas arcioniensis* (BROWN, 1976)
*Libythea celitis* (LACHARTING, 1764)
*Kirinia roxelana* (CRAMER, [1777])
*Coenonympha leander* (ESPER, [1783])
*Melanargia larissa* (GEYER, [1828])
*Hipparchia fagi* (SCOPOLI, 1763)
*Hipparchia syrtaca* (STAUDINGER, 1871)
*Satyrus ferula* (FABRICIUS, 1793)
*Chazara briseis* (LINNAEUS, 1764)
*Briniesia circe* (FABRICIUS, 1775)
*Brenthis hecate* ([DENIS & SCHIFFERMÜLLER], 1775)
*Melitaea trivia* ([DENIS & SCHIFFERMÜLLER], 1775)
*Melitaea aurelia* NICKERL, 1850.

Acknowledgements

My warmest thanks to Miguel MUNGUIRA (E–Madrid) for providing information on the habitat preferences of *Brenthis ino* in Spain, Alexander SLIVOV (BG–Sofia) for allowing access to his collection, Ronny LEESTMANS (B–Beersel) for the French translation of the summary and editing the manuscript, and particularly to Roland ESSAYAN (F–Fontaine les Dijon) for generously sharing his unpublished collecting data with me and permitting their use.

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