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NEW DATA ON THE DISTRIBUTION OF THE CROATIAN ENDEMIC BUTTERFLY *EREBIA STIRIUS KLEKI* LORKOVIĆ, 1955 (PAPILIONOIDEA, NYMPHALIDAE, SATYRINAE)

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The endemic butterfly *Erebia stirius kleki* Lorković, 1955 was found at Klečice (Klek Mountain, western Croatia), representing the known occurrence of this subspecies in Croatia. The biology of the species, the characteristics of a newly found site and the threat status of this endemic subspecies are also briefly discussed.

Key words: *Erebia stirius kleki*, endemic subspecies, Klečice, Croatia, threats

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Endemična podvrsta leptira *Erebia stirius kleki* Lorković, 1955 nađena je na planini Klek, na lokalitetu Klečice koji predstavlja treći lokalitet nalaza ove podvrste u Hrvatskoj. Raspravlja se o biologiji vrste, značajkama novootkrivenog lokaliteta kao i statusu ugroženosti ove endemične podvrste u Hrvatskoj.

Ključne riječi: *Erebia stirius kleki*, endem, podvrsta, Klečice, Hrvatska, ugroženost

INTRODUCTION

The aims of the paper are:

a) To present a brief history of the endemic taxon

b) To describe a new locality

c) To discuss the status of the locality and the endemic butterfly from nature conservation aspects

d) To present lists of butterfly fauna occurring in this area.

In the middle of the 20th century two spatially, geographically isolated subspecies of the alpine Satyrine *Erebia stirius* (Godart, 1824) were described as the south-easternmost populations of the nominal species: the mountain subspecies *kleki* Lorković, 1955 and the lowland subspecies *gorana* Lorković, 1985. The subspecies *E. stirius kleki* is restricted to Klek Mountain peak (LORKOVIĆ, 1955) and is therefore presumably endemic for Croatia. One female individual of this subspecies, collected on Bukovnik Hill near Ogulin on July 8th, 1891 by Gj. Koča (Central Butterfly Collection CNHM Zagreb, inv. no. 4589), was initially incorrectly determined as *Erebia gorge* Esp. (KOČA, 1901) and afterwards as *Erebia nerine* Frr. (KOČA, 1925). The specimen was finally correctly determined as *E. stirius kleki* by Z. Lorković (LORKOVIĆ, 1955). Hence the subspecies was recorded hitherto only at two sites.

E. stirius gorana is restricted to the Čučak and Pauci sites in Croatia and several more in Slovenia (Kuželj, Mirtoviči, Bosljiva Loka, Grintovec and Ribjek), all in upper course of the Kupa River (MLADINOV, 1978; LORKOVIĆ, 1985), so *E. stirius gorana* is not endemic for Croatia (Fig. 1). According to the Red Data List of Butterflies of Croatia Klek's Styrian Ringlet is in the Data Deficient (DD) category and

Fig. 1. The distribution of *Erebia stirius* (Godart, 1824) subspecies in Croatia: *1 – Erebia stirius kleki* Lorković, 1955 (Bukovnik, Klek Mt. peak, Klečice), *2 – Erebia stirius gorana* Lorković, 1985 (Čučak, Pauci), *3 – Erebia stirius nerine* (Freyer, 1831) (Baške Oštarije – Velebit Mountain)

Gorana's Styrian Ringlet in the Endangered (EN) category (ŠAŠIĆ & KUČINIĆ, 2004). *E. stirius kleki* is so classified because of its small distribution area and probably stabile habitat, although unconfirmed after 1959 (MLADINOV & LORKOVIĆ, 1985) and *E. stirius gorana* because of an unstable habitat in the succession and a small and restricted distribution area in Croatia. Both categories should be revised according to recent knowledge.

For many years Lorković tried to confirm the occurrence of the subspecies *Erebia stirius nerine* (Freyer, 1831) in the southern part of Gorski Kotar, on Mt Bjelolasica, on Bijele Stijene peak (all Mt Velika Kapela), and near Baške Oštarije (Mt Velebit) (LORKOVIĆ, 1952, 1955), according to specimens collected by M. Hilf (LORKOVIĆ, 1955; JUTZELER *et al*., 2002) and data (localities) cited in WARREN (1936) but did not succeed (LORKOVIĆ, 1955). However, according to JUTZELER *et al*. (2001a) and JUTZELER *et al*. (2002) in 1983 but never later, S. Ortner succeeded in finding one male specimen of *E. stirius nerine* near Baške Oštarije at 1000 m a.s.l. During our field trips to Mt Velebit in the last two years the Styrian Ringlet was not detected (MIHOCI *et al*., 2007). Specimens from Grabarje near Alan (Mt Velebit) determined as *Erebia nerine stelviana* Curo, 1871 (GUSSICH, 1917) Z. Lorković were correctly redetermined as *Erebia melas leonhardi* Fruhstorfer, 1918 (LORKOVIĆ, 1955; MLADINOV & LORKOVIĆ, 1985).

LORKOVIĆ (1955) supposed that *E. stirius nerine* specimens collected at »Fužine« (leg. M. Hilf) were collected in Slovenia (the Fužine near Ajdovščina) not in Croatia (the Fužine in Gorski Kotar). The site »Vis« – *Lissa-Adria Insel* (GUSSICH, 1917) (two specimens from ex coll. Taborsky, collected on August 14th, 1910, CNMH Zagreb, inv. no. 4590, 4591, determined by Z. Lorković as *E. stirius stirius*) is still doubtful and the precise detection of the collecting site is problematic (LORKOVIĆ, 1955). The potential larval host plant *Sesleria tenuifolia* Schrad. was established on Vis Island (E-SE slopes of Sv. Duh near Hum at 483 m a.s.l.)(http://hirc.botanic.hr).

E. stirius has one generation per year, with adults emerging in July and flying till the end of August (TOLMAN & LEWINGTON, 1997). It usually appears in rocky ground, such as cliffs (often entirely inaccessible like the one on Mt Klek) which are nevertheless able to support sparse vegetation (WARREN, 1936). Sexes have different behaviour. In general, males are more mobile than females because they are usually patrolling for the opposite sex, although occasionally they can be found resting on rocks. The less mobile females are found resting in the vegetation and often seen on flower heads (WARREN, 1936). As larval host plant of the species, TOLMAN & LEWINGTON (1997) cited Blue Moor-grass *Sesleria caerulea* (L.) Ard. According to JUTZELER *et al*. (2001b) larvae raised in captivity were kept on a tuft of Fescue (*Festuca* sp.). The larvae dominantly fed at night, before and after hibernation, although daytime feeding was sporadically observed as well.

According to LORKOVIĆ (1955) *E. stirius kleki* (Fig. 2) is restricted to the highest region of Mt Klek, to be precise, to a rock 400–500 m wide and 50 meters high on south-western cliff part just below the peak. It has never been found on the peak itself. LORKOVIĆ (1955) concluded that postglacial climates can hardly have been warmer than at present because these subspecies could not have survived and would be extinct on a mountain as low as Klek. This observation is also applicable to another isolated alpine butterfly population, the endemic *Erebia gorge vagana* Lorković, 1954.

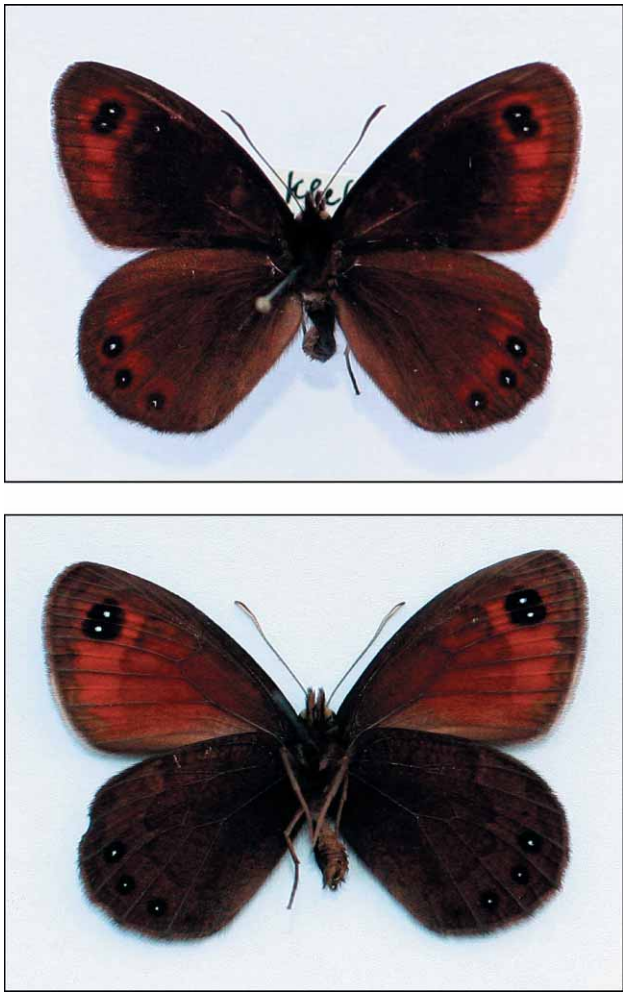

Fig. 2. *Erebia stirius kleki* Lorković, 1955 – forewing and hindwing upper and underside (coll. Lorković, CNHM Zagreb, photo: I. Mihoci).

MATERIAL AND METHODS

Butterflies were collected by traditional netting at several localities on Mt Klek, Velika Kapela massif on July 22nd, 2006. For systematic classification we have used KARSHOLT & RAZOWSKI (1996) and taxonomic determination by the wing morphology was done according to WARREN (1936) and TOLMAN & LEWINGTON (1997). Altitudes of visited localities were determined using a 1:25.000 ordnance map, coordinates using GPS device Garmin eTrex Summit, while photographs were taken with Canon EOS 20D.

RESULTS AND DISCUSSION

On July 22nd, 2006 the endemic butterfly *E. stirius kleki* was confirmed on the south-western rock on Mt Klek (LORKOVIĆ, 1955, 1985), and for the first time found in a new locality 0.6 km east of the first mentioned locality, on the second, lower rocky peak of the Mt Klek called Klečice (Fig. 3).

In fact, LORKOVIĆ (1955) had assumed that *E. stirius kleki* could be found on the 0.6 km distant Klečice rocks (1062 m). He did not confirm it because at the time of his field investigations there was cloud, which is generally unsuitable for butterfly activity. Klečice nowadays is not easily accessible. It is characterized by a few meter high calcareous rock/cliff belt partly overgrown by vegetation. This is a typical cliff vegetation of *Sesleria tenuifolia* Schrad. ssp. *kalnikensis* (Jav.) Deyl. growing on shelves

Fig. 3. Klečice (Klek Mt.) – newly found habitat of *Erebia stirius kleki* Lorković, 1955 in Croatia (photo: M. Vuković).

with scarce mosaic dwarf trees (Fig. 3). During two hours of sunny weather we observed four *E. stirius kleki* butterflies which flew around the rock from one shelf to another. On Klečice locality the larval host plant of the subspecies was not confirmed, but potential taxa, *Sesleria tenuifolia* ssp. *kalnikensis* and *Festuca* spp., have been previously found (http://hirc.botanic.hr). In addition, alpine grasslands with steep dry rocky slopes are represented with the community of *Seslerion tenuifoliae* Horv. (HORVAT, 1949, 1962). Future research on the ecology of the subspecies should therefore be directed at detecting all specific features of the Klek Styrian Ringlet life cycle, e.g.

like that conducted by LORKOVIĆ (1952) for *E. stirius* and *E. styx* (*styx/stirius*-complex), as well as, population size, abundance and dynamics. Population size, abundance and dynamics should also be established for the recently found threatened taxa in Croatia; *Leptidea reali* Reissinger, 1989 (=*lorkovicii* Real, 1988); *Allancastria cerisyi* (Godart, 1824) ssp. *dalmacijae* Sala & Bollino, 1994); *Coenonympha oedippus* (Fabricius, 1787); *Lycaena ottomanus* (Lefèbvre, 1830) and *Polyommatus* (*Agrodiaetus*) *damon* (Denis & Schiffermüller, 1775) (LORKOVIĆ, 1993; SALA & BOLLINO, 1994; KUČINIĆ *et al*., 1999; MIHOCI *et al*., 2005; 2006).

According to LORKOVIĆ's (1955) preliminary calculation of the abundance of 120 specimens and our observations in the past few years *E. stirius kleki* is one of the least abundant of all butterfly taxa in Croatia. Because of the small number of observed individuals and the overgrowing vegetation and succession are a threat leading to the disappearance on the existing habitats we propose the current threat category (ŠAŠIĆ & KUČINIĆ, 2004) be changed from DD to CR (Critically Endangered). Consequently, measures that should be conducted in conservation of this flagship taxon of the site and its habitat are initiating monitoring activities on Mt Klek, estimating population size and dynamics, preventing habitat succession as well as priority legal protection (establishment & management) of all determined sites.

Additionally, on July 22nd, 2006 24 butterfly species were collected or observed on the Mt Klek from Bjelsko (674 m a.s.l.) to Klečice peak (1062 m a.s.l.):

Bjelsko (674 m a.s.l.): *Thymelicus lineola* (Ochsenheimer, 1808), *Argynnis aglaja* (Linnaeus, 1758), *Brenthis hecate* (Denis & Schiffermüller, 1775), *Vanessa cardui* (Linnaeus, 1758), *Coenonympha arcania* (Linnaeus, 1761), *Melanargia galathea* (Linnaeus, 1758), *Brintesia circe* (Fabricius, 1775).

Beside the mountain trail to the peak (887 m a.s.l): *Pieris napi* (Linnaeus, 1758), *Pieris mannii* (Mayer, 1851).

Near the Klek mountain hut (1050 m a.s.l.): *Papilio machaon* Linnaeus, 1758, *Satyrium spini* (Denis & Schiffermüller, 1775), *Cupido minimus* (Fuessly, 1775), *Argynnis aglaja* (Linnaeus, 1758), *Melitaea athalia* (Rottemburg, 1775), *Coenonympha arcania* (Linnaeus, 1761), *Melanargia galathea* (Linnaeus, 1758), *Hipparchia semele* (Linnaeus, 1758).

Meadows below the south-western calcareous rock (1075 m a.s.l.): *Papilio machaon* Linnaeus, 1758, *Pieris napi* (Linnaeus, 1758), *Pieris mannii* (Mayer, 1851), *Gonepteryx rhamni* (Linnaeus, 1758), *Lycaena virgaureae* (Linnaeus, 1758), *Satyrium spini* (Denis & Schiffermüller, 1775), *Cupido minimus* (Fuessly, 1775), *Aricia agestis* (Denis & Schiffermüller, 1775), *Argynnis paphia* (Linnaeus, 1758), *Argynnis aglaja* (Linnaeus, 1758), *Issoria lathonia* (Linnaeus, 1758), *Inachis io* (Linnaeus, 1758), *Vanessa cardui* (Linnaeus, 1758), *Melitaea athalia* (Rottemburg, 1775), *Lasiommata megera* (Linnaeus, 1767), *Coenonympha arcania* (Linnaeus, 1761), *Melanargia galathea* (Linnaeus, 1758), *Erebia ligea* (Linnaeus, 1758), *Erebia stirius kleki* Lorković, 1955.

Near and on Klečice calcareous rock (1062 m a.s.l.): *Papilio machaon* Linnaeus, 1758, *Pieris brassicae* (Linnaeus, 1758), *Satyrium spini* (Denis & Schiffermüller, 1775), *Argynnis aglaja* (Linnaeus, 1758), *Issoria lathonia* (Linnaeus, 1758), *Melitaea athalia* (Rottemburg, 1775), *Coenonympha arcania* (Linnaeus, 1761), *Melanargia galathea* (Linnaeus, 1758), *Erebia stirius kleki* Lorković, 1955.

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References

GUSSICH, B., 1917: Ein Beitrag zur Schmetterlingesfauna Kroatiens. Glasnik hrvat. prirod. društva **29** (3–4), 209–225.

HORVAT, I., 1949: Nauka o biljnim zajednicama. Nakladni zavod Hrvatske, Zagreb, 434 pp.

HORVAT, I., 1962: Vegetacija planina zapadne Hrvatske. Acta biol. II, Prirodoslovna istraživanja **30**, 179 pp.

JUTZELER, D., REBEUŠEK, F., SALA, G. & VEROVNIK, R., 2001a: The confirmation of the specifity of *Erebia stirius* (Godart, 1824) and *Erebia styx* (Freyer, 1834), diagnosed by Lorković (1952) with a nomenclatural abstract concerning the specific names of the *styx/stirius*-complex (*Lepidoptera: Nymphalidae, Satyrinae*)(1st part). Linneana Belgica **18** (3), 113–124.

JUTZELER, D., REBEUŠEK, F., SALA, G. & VEROVNIK, R., 2001b: The confirmation of the specifity of *Erebia stirius* (Godart, 1824) and *Erebia styx* (Freyer, 1834), diagnosed by Lorković (1952) with a nomenclatural abstract concerning the specific names of the *styx/stirius*-complex (*Lepidoptera: Nymphalidae, Satyrinae*)(2nd part). Linneana Belgica **18** (4), 175–186.

JUTZELER, D., SALA, G., MORANDINI, C., VEROVNIK, R. & VOLPE, G., 2002: The identification, variation, races and distribution of *Erebia styx* (Freyer, 1834) and *E. stirius* (Godart, 1824) (*Lepidoptera: Nymphalidae, Satyrinae*) (4th part of the *styx/stirius*-series devoted to *Erebia stirius*). Linneana Belgica **18** (7), 335–350.

KARSHOLT, O. & RAZOWSKI, J., 1996: The Lepidoptera of Europe. A Distributional Checklist. Apollo Books, Stenstrup. pp. 380.

KOČA, GJ., 1901: Prilog fauni leptira (Lepidoptera) Hrvatske i Slavonije. Glasnik Hrv. naravosl. druš. **13** (1–3), 1–67.

KOČA, GJ., 1925: Drugi prilog fauni leptira (Lepidoptera) Hrvatske i Slavonije. Glasnik Hrv. prirodosl. druš. **16** (1–2), 58–63.

KUČINIĆ, M., TVRTKOVIĆ, N. & KLETEČKI, E., 1999: The False Ringlet (*Coenonympha oedippus* F.) is a member of the Croatian butterfly fauna after all. Nat. Croat. **8**(4), 399–407.

LORKOVIĆ, Z., 1952: Beiträge zum Studium der Semispecies. Specifität von *Erebia stirius* Godt. und *E. styx* Frr. (*Satyridae*). Z. Lepidopt. **2** (3), 159–176.

LORKOVIĆ, Z., 1955: Die Populations analyse zweir neuen stenochoren *Erebia* – Rassen aus Kroatien. Biološki glasnik **8**, 53–76.

LORKOVIĆ, Z., 1985: Taxonomische Differenzierung der südöstlichsten Populationen von *Erebia stirius* Godart 1824 (Lep., Satyridae). Acta entomologica Jugoslavica **21** (1–2), 9–15.

LORKOVIĆ, Z., 1993: *Leptidea reali* Reissinger 1989 (=*lorkovicii* Real 1988), a new European species (Lepid., Pieridae). Nat. Croat **2**(1), 1–27.

MIHOCI, I., TVRTKOVIĆ, N. & ŠAŠIĆ, M., 2005: Grecian Copper *Lycaena ottomanus* (Lefèbvre, 1830) (Lepidoptera, Lycaenidae) – a new species in the Croatian butterfly fauna. Nat. Croat. **14**(4), 255–262.

MIHOCI, I., VAJDIĆ, M. & ŠAŠIĆ, M., 2006: The status of the Damon Blue *Polyommatus (Agrodiaetus) damon* (Denis and Schiffermüller, 1775) (Papilionoidea: Lycaenidae, Polyommatini) in the Croatian butterfly fauna. Nat. Croat. **15**(1–2), 15–25.

MIHOCI, I., ŠAŠIĆ, M. & VUKOVIĆ, M., 2007: Contribution to the butterfly fauna (Hesperioidea & Papilionoidea) of the Velebit Mountain, Croatia. Natura Croatica **16**(1), 29–62.

MLADINOV, L., 1978: Prvi dodatak poznavanju faune Macrolepidoptera iz doline gornjeg toka rijeke Kupe. Acta entomologica Jugoslavica **14** (1–2), 63–67.

MLADINOV, L. & LORKOVIĆ, Z., 1985: Rasprostranjenje montanih Macrolepidoptera u fauni Hrvatske, Jugoslavija. Acta entomologica Jugoslavica **21** (1–2), 17–36.

SALA, G. & BOLLINO, M., 1994. *Allancastria cerisyi* Godart, 1822 in the Balkans: new subspecies and critical notes on the existing populations (Lepidoptera: Papilionidae). Atalanta **25**(1–2), 151–160.

ŠAŠIĆ, M. & KUČINIĆ, M., 2004: The Red Data List of Croatian Butterflies. In MARKOVIĆ, D. (ed.). Državni zavod za zaštitu prirode, Zagreb.

TOLMAN, T. & LEWINGTON, R., 1997: Butterflies of Britain and Europe. Harper Collins Publishers. London, pp. 320.

WARREN, B. C. S., 1936: Monograph of the Genus *Erebia*. British Museum (Natural History). London. vii + 407 pp. + 104 pls.

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SAŽETAK

Novi podaci o rasprostranjenju endemičnog leptira *Erebia stirius kleki* Lorković, 1955 (Papilionoidea, Nymphalidae, Satyrinae) u Hrvatskoj

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Nominalna vrsta *Erebia stirius* (Godart, 1824) zastupljena je u Hrvatskoj s podvrstama *Erebia stirius nerine* (Freyer, 1831), *Erebia stirius kleki* Lorković, 1955 i *Erebia stirius gorana* Lorković, 1985 (WARREN, 1936; LORKOVIĆ, 1955; MLADINOV, 1978; LORKOVIĆ, 1985; MLADINOV & LORKOVIĆ, 1985; JUTZELER *et al*., 2001a; 2002).

Terenskim istraživanjima u srpnju 2006. godine endemična podvrsta leptira *E. stirius kleki* Lorković, 1955 potvrđena je na planini Klek na jugozapadnoj stijeni podno vrha Kleka i prvi puta nađena na 600 metara udaljenom lokalitetu Klečice. Uz Bukovnik i jugozapadnu stijenu podno vrha Kleka, Klečice su treći lokalitet nalaza ove podvrste u Hrvatskoj. Potencijalne biljke hraniteljice *Sesleria tenuifolia* ssp. *kalnikensis* i *Festuca* spp. našim istraživanjem nisu potvrđene, ali su za prostor Kleka prethodno zabilježene (http://hirc.botanic.hr).

Mjere zaštite ove endemične svojte u Hrvatskoj trebalo bi usmjeriti na proučavanje veličine i dinamike populacija/e, sprečavanje sukcesije staništa, praćenje stanja staništa i brojnosti vrste, kao i zakonsku zaštitu lokaliteta.