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Life histories of *Erebia sudetica sudetica* and *E. epiphron silesiana* with description of immature stages

(Lepidoptera, Nymphalidae, Satyrinae)

by

TOMÁŠ KURAS, JIŘÍ BENEŠ, MARTIN KONVIČKA & LUBOMÍR HONČ

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Summary: The life cycies, morphology and behaviour of the immature stages of the ringlets *Erebia sudetica sudetica* and *E. epiphron silesiana* inhabiting the Hrubý Jeseník Mts. (= Altvatergebirge; Czech Republic) are presented. Immature stages of *E. sudetica* are described here for the first time. Both species have been reared to maturity from eggs laid by females caught in the wild. Out of accord with hitherto attainments, both species preferred *Festuca supina* as the main host plant (in choice experiments, *E. epiphron* preferred *Avenella flexuosa*). In rearing experiments, the species overwintered only once and finished their development within a one-year period. Highest mortality of individuals appeared during overwintering of L2- (*E. sudetica*) and L3-larvae (*E. epiphron*).

Introduction

Five species of the species-rich holarctic genus *Erebia* DALMAN, 1816, which is renown for high diversity in alpine and arctic habitats, frequent endemism and subspecific differentiation (WARREN, 1936), occur in the Hrubý Jeseník Mts. (= "Altvater Gebirge", Eastern Sudetes), Czech Republic (STIOVA, 1988). Two of them, *Erebia sudetica sudetica* STAUDINGER, 1861 (col. pl. XII, fig. 1) and *E. epiphron silesiana* MEYER & DÜR, 1852 (col. pl. XII, fig. 2) form endemic subspecies in these mountains. Both species have a restricted distribution, and *E. sudetica* is considered to be threatened on European scale (VAN SWAAY & WARREN, 1999). The ecology of the two subspecies is under detailed study since the mid 1990s; our previous papers focused on their habitat preferences, population ecology, distribution and adult behaviour (KURAS et al., 2000; KURAS et al., in print; KURAS et al., in litt.).

The life history of *Erebia sudetica* is poorly known, only sparse and scattered information regarding its development had been published [e.g., SCHWEIZERISCHER BUND FÜR NATURSCHUTZ (= SBN), 1987]. The other species of interest, *Erebia epiphron*, was studied in much detail, but namely with regard to the subspecies that inhabits the British Islands (e.g., PORTER & EMMET, 1989; BAYFIELD & TAYLOR, 1994; RAVENSCROFT & WARREN, 1996). On the other hand, the knowledge of the subspecies of the continental mountains is still limited and nothing is known about possible subspecific differences in development, foodplant preferences or behaviour (e.g., SCHWARZ, 1948; SBN, 1987).

Here, we describe for the first time details of the development of *E. sudetica sudetica* STAUDINGER, 1861, as well as of the local subspecies *E. epiphron silesiana* MEYER & DÜR, 1852. Besides data from rearing in captivity, we refer to some field observations from our fieldwork from 1996-1998. Hereinafter, we focus on larval behaviour; in the latter species we also discuss duration of larval development. Additionally, we present results of a simple experiment with host plant preferences of the Hrubý Jeseník subspecies of *E. epiphron*.

Method of rearing in captivity

We reared adults of both species from eggs, which were laid by females caught in the wild near Barborka Chalet (50°04'N, 17°14'E, 1380 m a.s.l.) on the Praděd Mt. The rearing experiment of *E. sudetica* passed since July 1996 to summer 1997 when the adults emerged, and subsequently *E. epiphron* since July 1997 to summer 1998.

Wild caught fertilised females of both species were put into two identical rearing cages (150×60×60 cm) covered by netting and situated outdoors in a lowland garden (49°58'N, 18°05'E, 280 m a.s.l.). Inside the cages, we planted tufts of *Nardus stricta, Festuca supina*, and *Deschampsia caespitosa* (i.e., the common grasses at the original locality and mentioned as host plants by different authors) set into a humid peat-substrate. The tufts were regularly sprayed with water to maintain sufficient humidity inside. Low-concentrated sugar solution has been offered as sustenance to the ovipositing females.

Erebia sudetica sudetica STAUDINGER, 1861

Adult flight lasts from mid July until late August (seldom to early September) in the area. The species forms patchy colonies in secluded, wind-protected and moist sites at timberline such as springs on avalanche slopes or valley headwalls (col. pl. XII, fig. 3). Some colonies are also found on clearings and meadows in the upper forest zone (STIOVA, 1988; KURAS et al., in print). All these sites are covered with diverse vegetation with numerous potential nectar plants. Emergence of males reaches a peak about 6–7 days before females, and they are more conspicuous due to their main activity, patrolling mate-locating behaviour (KURAS et al., in litt).

The rearing in captivity was based on 50 females. They laid about 300 eggs in total, from which we obtained 12 adults (all males). The first larvae hatched in late July and August. In hatching, they ate round caps of the eggs and pushed them up to escape. We did not observe feeding on the chorion after eclosion.

During development, they were rather passive, as they adhered to grass blades for most of the time (except of the first instar). Predominate activity throughout larval life was basking (especially in the L1- and L2-instars) and feeding. They fed on apical parts of grass blades, feeding then proceeded from distal parts towards bases. They basked or rested between centres and apical thirds of leave lengths. They consumed mainly *Festuca supina*; less often *Deschampsia caespitosa*, and seemed to reject *Nardus stricta*. If disturbed, they released their grip and fell into grass-tussocks. The larvae pupated at the base of the dense grass tufts. In vertical position, they spun scarce cocoons among surrounding grass-blades; metamorphosis into pupae took 3–4 days, pupal period lasted about two weeks (tab. 1). Imagines hatched during morning hours.

Winter hibernation occurred in the L2-instar (exceptionally also in the L3-instar). It lasted from mid September until late March. They hibernated hidden in litter near the bases of grass-tussocks. Overwintering was the critical phase in individual development, since winter mortality was about 90%. Compared to this, mortality in the other stages was almost negligible.

Although MANSEL (1985) and WIPKING & MENGELKOCH (1994) referred that larvae of various *Erebia* species feed during daytime before overwintering but exclusively at night after winter, we observed in captivity that all larval stages fed during daytime. We also captured some L3-larvae by sweeping of vegetation during daytime (July 1997, Praděd Mt.), and KUDLA (1970) located fully-grown larvae in the wild in late afternoons/early evenings "sitting on grass blades" towards the end of June. Thus, we do not support for that species the notion of differences in day vs. night activity in early as opposed to late instars.

Immature stages (tab. 1)

Egg: Similar to that of the other satyrids of comparable size, but markedly elongated with flattened top and base (see SONDEREGGER, 1980). There are 23–26 well-defined longitudinal ribs externally, which run directly upwards. The eggs are coloured whitish with a greenish touch immediately after being laid; during mid-stage they get a pale cream colour with reddish spots. The chorion becomes transparent before hatching (the egg appearing grey with the larva visible). We counted 17 (SD 4.1) mature (i. e., 1–1.2 mm long, barely-elongated, with clear longitudinal ribs) and 18 (SD 5.8) immature eggs (i. e., 0.5–0.9 mm, cylindrical-elongated, without clear longitudinal ribs) per female, by dissection of 15 females captured in the wild.

Larva: Immediately after hatching, the larva (L1) is entirely light and gradually gets brownish, the ventral part of the larval body (including true legs, prolegs and anal prolegs) is whitish, the lateral and dorsal parts are of a pale grey hue. The coloration changes a little on the second day after eclosion, concurrently with initiation of food intake, the originally rather transparent coloration shifting into greenish. Spiracles are not diverse in colour. Dorsal and subdorsal parts of the trunk with several very short colourless setae, less then 0.01 mm long. The head capsule is rounded with a closely punctured surface covered by ca. 0.01 mm long setae, mouthparts are slightly pale grey-brown, ocelli are indicated darker. After the first moulting, the larva (L2) gets a pale yellowish brown colour with five narrow brown stripes–two pairs of subdorsal and lateral (whitish bordered ventrally) stripes, and a thin single dorsal stripe. The concolorous setae on its body and head are short (0.07–0.08 mm). The third stage (L3) is characterised by a pale brown colour with various shades of brown and ochre with a feint greenish touch (col. pl. XII, fig. 5). The five brown longitudinal stripes dominate the coloration. The oval spiracles are dark brown (beige bordered around) inside the lateral brown stripes. The trunk is circular in cross-section of the thoracic region and more semi-circular towards posterior. Transverse dark brown furrows mark the segmental divisions. In addition to the furrows between segments, there are three or four minor brown transverse furrows on each segment. Dark brown setae on the trunk are more dense compared to those on the head, approximately 0.4 mm long (particularly conspicuous are the subdorsal setae with their black brown tips). The terminal segment with a pair of obvious "tails" (0.4 mm long) above the anus. Proleg crochets of uniform length (0.08 mm), in a single batch. The whole head is covered with short brownish grey setae (0.3 mm). The dorsal and lateral surface of epicrania (above ocelli) is scabrous with uniform spotted pattern. Ground colour of the capsule is pale gravel with minute whitish spots. Ocelli and mouthparts are conspicuously black brown.

Regretfully, we can not provide description of the later L4(L5)-larval stage(s) here, since the larvae of *E. sudetica* pupated during the second half of May 1997, when we studied both species in the field. Thus, our only observation of L4-larvae was the case of two L3-larvae sampled in wild and kept in captivity while moulting. Interestingly, the two L4-larvae remained grey brown coloured after the moult, although in SBN (1987: 266) there is a photograph of a *E. sudetica* larva which is grassy-green.

Pupa: The pupa is thick and short. Ground colour is beige-whitish with dark brown markings. The abdominal segments consist of longitudinal rows with double black-brown spots on each segment. The head is approximately half as wide as the thorax; haustellum reaches more than

¾ of the body length; nervation of wings and distal part of proboscis are black-brown; the whitish cremaster short cuspate into two points.

Table 1: Basic characteristics and duration of the immature stages of *Erebia sudetica sudetica* (based on captive rearing during 1996–1997).

Erebia sudetica	Length (mm)	Length:width ratio	Duration (days)	Date(s)	Head capsule (mm)	Ground colour
Ovum	1.2	1.5	14–16	6.VIII.–28.VIII.		whitish, red spots
L1	1.5–2.5	6.1	10–12	23.IX.–3.IX.	0.50–0.65	transparent ochre-brown
L2	3.2–6.0	5.3	ca. 200*	30.VII.–15.IV.	0.75–0.80	beige-brown
L3	8.1–14.0	5.1	ca. 30	13.IV.–16.V.	ca. 2.5	pale grey-brown
L4 (L5)						
Pupa	ca 12.0	2.5	11–14	1.VI.–14.VI.		beige-white, black-brown marking

*including ca. 170 days of hibernation (since end of September until beginning of April).

Erebia epiphron silesiana Meyer & Dür, 1852

It inhabits grassy alpine tundra above the timberline in the Hrubý Jeseník Mts. (col. pl. XII, fig. 4), where it occurs from late June/early July until mid August in two large, continuous populations (Kuras et al., in print; Kuras et al., in litt.). Its distribution throughout the relatively uniform habitat is not regular, since the adults tend to aggregate at places with abundantly flowering *Bistorta major* (principal nectar plant). Besides nectaring, males patrol in search for females for most of the time. At evenings, the butterflies aggregate at discrete sites with larger shrubs of *Vaccinium myrtilus* or at patches of with *Molinia coerulea* or *Luzula sylvatica*, where they also spend the nights.

Regarding number of matings, we found that females are able to mate repeatedly. Dissection of 49 wild-captured females showed that 1 of the females was virginal, 45 carried one and 3 of them had two spermatophores in their bursae copulatrix.

The rearing in captivity was based on 11 females caught in wild, which laid ca. 450 eggs, from which we obtained 15 adults (9 males, 6 females). The females oviposited at all the three grass species and at all parts of the tufts inside the rearing cage. They apparently did not discriminate between living and dead parts of the tufts, but laid the majority of the eggs at the basal thirds of the grass blades. The larvae hatched in mid August. They went to hibernation in late September (in L3-instar) and had 5 instars in total. Pupation took 2 to 4 days and adults emerged in late June. Thus, the captivity-reared individuals had a one-year development.

Festuca supina was the absolutely preferred host plant of the captive caterpillars. Practically all individuals aggregated and fed on that plant. They were not much active, did not show any tendency to wander and did not attack one another, despite their close clumping on the single tuft.

As in *E. sudetica*, hibernation was the critical period in larval life. Crudely estimated overwintering mortality was about 90%. This particularly affected the larvae that terminated their hibernation preliminarily, which we observed both in late autumn and too early in spring.

Although our captive larvae developed within one year, literature often states that *E. epiphron* may have a two-seasonal development (e. g., Wheeler, 1982; Wipking & Mengelkoch, 1994). A possibility that the situation may be more complex in the wild was suggested by our observations concerning the level of development of the 33 larvae that we found in the field (either by direct search or by net-sweeping, see bellow). Of them, 27 were "small" (< 9 mm), and thus belonged to L2- or L3-instars, while 6 were "large" (> 10 mm), and thus were later instar(s). It is unlikely that the "large" larvae would develop to such a size so early in season, and we thus assume that they could have originated from the previous year. The large larvae pupated in the beginning of September of the same year, and adult butterflies emerged late in the same month. Such a late adult emergence would be nonsensical at the original locality, because flight period of the species is well over towards the end of August there, and first frosts regularly start at the beginning of September. The finding rather suggests that *E. epiphron* had a flexible one- to two-year "semivoltine" development, depending on impacts of weather conditions on the physiological situation of individual larvae, in the area under study.

Although literature often states that *E. epiphron* larvae are active at night (see Ravenscroft & Warren, 1996), we encountered actively feeding caterpillars during sunny days in field (12.50–16.40) in 14 cases. Typically, they fed at the distal parts of grass blades, in the middle of cross-sections of the tufts.

Immature stages (tab. 2)

Egg: It is barrel-shaped, with 17–18 well-defined longitudinal ribs externally running directly upwards. The colour of freshly laid eggs is pale cream; the ground colour darkens after three days and there appear brown-reddish spots. The chorion becomes slightly transparent before hatching and the larva becomes visible. In average, we found 9.6 (SD 5.6) matured (i. e., 0.9–1 mm long, barrel-shaped with clear longitudinal ribs) and 21.6 (SD 12.3) immature eggs (i. e., 0.5–0.8 mm, cylindrical without clear longitudinal ribs) per female, by dissection of 49 wild-captured females.

Larva: Freshly hatched L1-larvae are pale brown with five longitudinal brownish stripes; narrow dorsal strip, two pairs of subdorsal and lateral stripes (the latter are bordered by whitish tinge). The transparent brownish body becomes green with the initiation of food intake (especially the fore body). The spiracles are nerveless and concolorous with the body. Terminal "tails" are absent and the trunk blankly ends with six setae (ca. 0.05 mm). The dorsal and lateral parts of the trunk with darker wart-like points, each terminated by very short setae, about 0.01 mm long. Head spherical, initially yellowish brown, gradually becoming slightly greenish, mouthparts and ocelli are darker. The surface of the head capsule is minutely punctured, the frontal part with several colourless setae (ca. 0.03 mm). The L2-larva is green with five dark green longitudinal stripes (dorsal, subdorsal and lateral). The lateral stripe is ventrally bordered by a conspicuous white stripe. The previous ochre brown colour of the L1 retained only on the terminal segment with the anal prolegs and the "tails" (ca. 0.1 mm long). The trunk is covered by fine and very short setae (ca. 0.02 mm) arising from wart-like points; laterally situated minute spiracles (inside the lateral dark brown stripe) are circular and dark red-brown. The head capsule with a pitted surface is uniformly pale green. The adfrontal part is covered by short setae, maximally 0.06 mm long. In L3- and L4-instars continued development of patterns and colours of the previous instar. Except the quantitative patterns (see tab. 2) they are consistent with the L5-instar. The last (L5) instar (col. pl. XII, fig. 6), before pupation, is typically of a grassy-green ground colour, with a dark green narrow subdorsal stripe and two pairs of pale longitudinal stripes on each body side (a fine yellowish stripe subdorsaly, and a conspicuous wide white stripe lateraly). Both pairs of stripes are outlined darker green and with a fine pale green line in between (near above the spiracles). The spiracles are circular, dark red-brown, each with an adjoining minute yellowish green spot. The true legs are green with a brown touch, prolegs and anal prolegs are green. Proleg crochets are of uniform length (ca. 0.05 mm), in a single batch. The trunk is more or less circular in section, segmental divisions marked by 3–4 minor transverse furrows on each segment. The surface is covered by short (ca. 0.03 mm) setae arising from wart-like points. The terminal segment arising to ca. 0.4–0.5 mm long ochre-green "tails" Before pupation, the maximum width of the trunk is at the first third of the body length and is tapering slightly towards the head (more markedly towards posterior). The grainy head capsule is dark green, covered by short setae (ca. 0.03 mm). The frontal and adfrontal parts of the head are covered by pale-green setae (max. 0.2 mm long).

Pupa: The pupa is thick and short, greenish with black drawing (i. e., fundaments of wing nervation, proboscis, antennas and legs), immediately after pupation. It looses these drawings later and turns uniformly dark brown; shortly before hatching the wing drawing fundaments become visible throughout. The head is more than half as wide as the thorax; the haustellum reaches ca. ⅔ of the body length; dorsal part of mesothorax gibbous, medial keel absent (only indicated dark); greenish cremaster somewhat cuspated.

Table 2: Basic characteristics and duration of the immature stages of *Erebia epiphron silesiana* (based on captive rearing during 1997–1998).

Erebia epiphron	Length (mm)	Length:width ratio	Duration (days)	Date(s)	Head capsule (mm)	Ground colour
Ovum	1.0	1.7	15–21	23.VII.–11.VIII.		pale cream, red-brown spots
L1	1.7–3.1	5.8	9–12	10.VII.–28.VII.	0.55–0.60	transparent pale brown
L2	4.5–5.1	5.5	20–25	19.VII.–7.IX.	0.70–0.76	green
L3	5.6–9.2	5.3	ca. 210*	3.IX.–8.V.	0.9–1.1	green
L4	9.0–16.2	5.1	ca. 20	8.V.–30.V.	1.2–1.4	green
L5	15.3–21.1	4.5	ca. 15	27.V.–15.VI.	1.5–1.7	green
Pupa	12–13	ca. 3	16–20	10.VI.–30.VI.		greenish, black-brown marking

*including ca. 170 days of hibernation (since end of September until beginning of April).

Host-plant preferences

For the (best-studied) British colonies of *E. epiphron*, the grass *Nardus stricta* is considered as a likely larval host plant (Porter & Emmet, 1989; Ravenscroft & Warren, 1996). However, several indices suggested that it could not be so in the Hrubý Jeseník Mts., since when we located 14 feeding larvae in field in July 1997, they fed *Festuca supina* (11) and *Avenella flexuosa* (3). The captive caterpillars also apparently preferred *F. supina*. These observations suggested that *Nardus stricta* might not be the preferred hostplant of *E. epiphron* in the area studied. Indeed, multiple authors mentioned as host plant of *E. epiphron* several other species of graminoids, such as *Aira praecox, Carex pilulifera, Festuca ovina, F. rubra, Danthonia decumbens, Deschampsia cespitosa* or *Poa annua* (e. g., SCHWARZ, 1948; PORTER & EMMET, 1989; HIGGINS & RILEY, 1993; WEIDEMANN, 1995).

To elucidate host plant preference of the Hrubý Jeseník population, we performed a simple "selection experiment" with 33 wild-collected L3- and L4-larvae in July 1997. We used the 14 larvae mentioned above (for which we knew the original foodplant) and additional 19 larvae captured by net-sweeping. All the larvae originated from the Velký Máj Mt., 1380 m a.s.l. We tested four grass species: three were short grasses that dominated the tundra vegetation of the site, i. e., *Festuca supina, Nardus stricta* and *Avenella flexuosa*; the fourth was *Poa annua*, a lowland weed invasive in the area (along tourist paths). Each larva was placed separately in the centre of a plastic Petri dish (diameter 7 cm, depth 1 cm) with a choice of leaves of the four grasses (3 cm long pieces of the blades) that were placed in four positions at equal distances around the edge. We controlled each dish in 24 hours intervals during four subsequent days. In each control, we registered presence of feeding damages at the offered plants. Following each control, we recovered fresh leaves, shuffled relative positions of individual grass species, and re-positioned the larvae into centres of the dishes.

Presence of feeding damages differed significantly between the four grasses (ANOVA, $F = 6.19$; d.f. = 3, 128; $p < 0.001$). The preferred plant was *Avenella flexuosa* (N = 20 feeding damages), followed by *Festuca supina* (N = 11). The other two species were clearly avoided: N (*Nardus stricta*) = 1, TUKEY's HSD test *Avenella flexuosa* vs. *Nardus stricta*: $p < 0.001$; N (*Poa annua*) = 3, *Avenella flexuosa* vs. *Poa annua*: $p < 0.01$. Thus, *Avenella flexuosa* was the preferred foodplant, followed by *Festuca supina*, but the larvae rarely fed even on the other two offered species.

Discussion

We observed that overwintering mortality was the critical phase of our rearing experiment in both *Erebia* species. Such a high mortality was likely caused by exposure of the rearing cages to bare frosts (without snow cover) during winter. Moreover, the captive caterpillars had to endure fluctuating thermal conditions typical for late autumn/early spring in lowland, with warm days and freezing nights. In that times, we observed that some of them interrupted quiescence and left their overwintering buries and died. The animals barely experience such conditions in the wild, since their localities are under continuos snow cover for the whole winter. Thus, it seems that the *Erebia* larvae may not be physiologically adapted to low freezing temperatures during beginning and end of diapause (see MANSEL, 1985), in spite of WIPKING & MENGELKOCH (1994) recorded that supercooling ability in *Erebia* species exceeds −30 °C.

The above observation is in good agreement with our findings on the duration of the individual development. The fact that we found in wild at the same time larvae of early and late instars suggests that their development may not be governed by some fixed cues, such as light period, and that they rather respond to immediate thermal conditions. Post-hibernation (spring) larvae which would not, as a result of climatic or other constraint, finish their development in a given season, might hibernate a second time and finish their development one season later. Such flexibility would be advantageous for species occurring in environments with harsh and unpredictable climate (cf. SØME, 1997). If this is so in alpine *Erebia*, it would explain many so far unresolved controversies regarding presumed biennial development in that genus (e. g., WHEELER, 1982; WIPKING & MENGELKOCH, 1994). Indeed, already WARREN (1936) presumed a flexible length of development in alpine *Erebia*, such a phenomenon is well documented for several northern Lepidoptera (DOUWES, 1980; KUKAL, 1993) and for butterflies near the northern limits of their range (WAHLBERG, 1998). Still, the knowledge regarding development of the two *Erebia* butterflies is far from complete and deserves further research focused on diapause formation, cold hardiness and other traits.

We found that, contrary to reports from Britain, the grass *Nardus stricta* was not the preferred host plant of *E. epiphron silesiana*. The most preferred plants in the experiment have been *Avenella flexuosa* and *Festuca supina*, and both *E. epiphron* and *E. sudetica* preferred *F. supina* in captivity. Our finding thus corroborates the often-reported fact that *Erebia* satyrids are not strictly monophagous and are able to develop on a wider range of grass species.

Questionable remains the final instar of *Erebia s. sudetica* and its coloration. Unfortunately, we did not ascertain how many instars the species passed through during its larval development. MANSEL (1985) setting that all of the one-year development *Erebia* species and overwinter in L2- and/or L3-instar (i. e., including *E. sudetica*) have four instars on the whole. Contrary to this, WIPKING & MENGELKOCH (1994) hold the view that all the *Erebia* species have five larval instars bar none. It comes to this, that if *E. s. sudetica* has only four instars during its larval development (sensu MANSEL, 1985), the larva colour remains during the whole of its life span pale-brown and differs markedly in colour from that recorded by SBN (1987: 266). In the case, the larval development consists of five instars, we can not exclude an entire change in coloration (into grassy-green) in the L5-instar (likewise *E. melampus*). A more detailed study of the developmental stages of the individual subspecies of *Erebia s. sudetica* is necessary, since it may contribute to resolving their taxonomic status.

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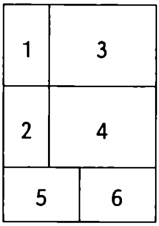
Explanation of colour plate XII (p. 287):

Fig. 1: Adults of *Erebia sudetica sudetica*, ♂ (above; length of forewing 15.5 mm), ♀ (below; forewing 16 mm), Malý Kotel, July 1997.
Fig. 2: Adults of *Erebia epiphron silesiana*, ♂ (above; length of forewing 17.5 mm), ♀ (below; forewing 19 mm), Velký Máj Mt., July 1997.
Fig. 3: Representative habitat of *Erebia sudetica*, glacial cirque near timberline (Malá Kotlina, about 1200 m a.s. l., Hrubý Jeseník Mts.).
Fig. 4: Representative habitat of *Erebia epiphron*, grassy alpine tundra (Vysoká Hole Mt., 1462 m a.s. l., summit part of the Hrubý Jeseník Mts.).
Fig. 5: *Erebia sudetica*, larva of 3rd instar in dorsal and lateral views (larval length 13 mm).
Fig. 6: *Erebia epiphron*, larva of 5th instar in dorsal and lateral views (larval length 20.5 mm).



addresses of the authors

Tomáš Kuras
Department of Ecology
Faculty of Sciences, Palacký University
tř. Svobody 26
CZ-77146 Olomouc
Czech Republic
e-mail: kuras@risc.upol.cz

Jiří Beneš & Martin Konvička
Department of Zoology, School of Biological Sciences
University of South Bohemia
Branišovská 31
CZ-37005 České Budějovice
Czech Republic

Lubomír Honč
Albertovec 299
CZ-74723 Bolatice
Czech Republic

Colour plate XII

Kuras,T., Beneš, J., Konvička, M. & H. Lubomír: Life histories of *Erebia sudetica sudetica* and *E. epiphron silesiana* with description of immature stages (Lepidoptera, Nymphalidae, Satyrinae). – Atalanta **32** (1/2): 187–196.

Fig. 1: Adults of *Erebia sudetica sudetica*, ♂ (above; length of forewing 15.5 mm), ♀ (below; forewing 16 mm), Malý Kotel, July 1997.
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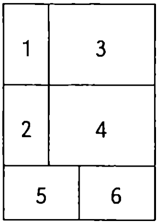
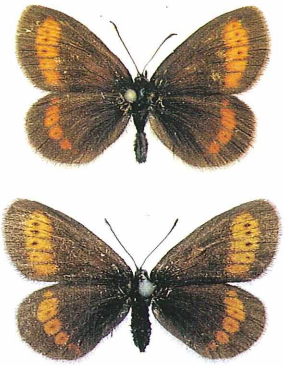
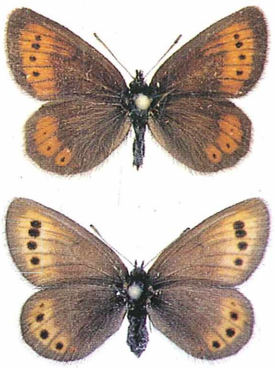
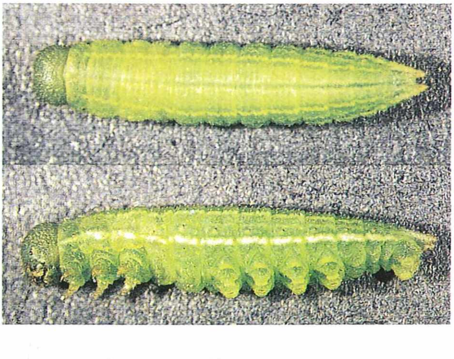


Colour plate XII







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