Hypnum sauteri and *Lescuraea patens*, two additions to the moss flora of the Czech Republic

Dvě novinky v bryoflóře České republiky – *Hypnum sauteri* a *Lescuraea patens*

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Hypnum sauteri and *Lescuraea patens* are reported new and *Hypnum recurvatum* confirmed for the bryoflora of the Czech Republic. The two *Hypnum* species have been discovered in the valley of Rudný potok brook, *Lescuraea patens* has so far been recorded at several microsites in the glacial cirques of Mt Kotel, Labský důl valley and Úpská jáma cirque (all localities in the Krkonoše Mts). Full details of the localities are described, the plants are illustrated, and their ecology, distribution and diagnostic characters are briefly discussed.

K e y w o r d s : Krkonoše Mts, the Sudetes, *Hypnum*, *Lescuraea*, bryoflora, threatened

Introduction

A detailed bryofloristic inventory survey of the Krkonoše Mts is in progress within the grant project no. 206/01/0411 of the Grant Agency of the Czech Republic (aimed at the glacial cirques) and the PhD thesis of the last author (aimed at calcareous outcrops) in the last years. Two taxa new to the bryoflora of the Czech Republic have so far been discovered – *Hypnum sauteri* Schimp. and *Lescuraea patens* Lindb.

The finds of both species were highly surprising, as both are generally well-defined and accepted, and the region has been densely surveyed in the past. Recent finds of historically well-known species seem, however, to be no exception as a result of detailed surveys of even the best known places (viz. the discovery of *Andreaea nivalis* Hook. in the cirque Mały Śnieżny Kocioł on the Polish side of the Krkonoše range – Fudali & Kučera 2002).

The nomenclature of moss taxa in the text follows Váňa (1997) except for newly recorded taxa.

Hypnum sauteri

In 1998, one of the authors (PH) made a puzzling *Hypnum* collection in the well-known locality Rudník in the Krkonoše Mts (SW slope of Mt Sněžka). He named it *Hypnum sauteri* – then a new species for the Czech flora, and sent it to the first author for confirma-

Table 1. – Differentiating characters of *Hypnum sauteri* and *H. recurvatum.*

	H. sauteri	*H. recurvatum*
Size (cm)	1–2	2–5
Stem cross-section	± rounded	oval
Central strand of the stem	not developed	developed
Stem leaf size (mm)	0.5–0.7 × 0.2–0.3	0.7–1.3 × 0.3–0.5
Leaf margin	always flat	flat or recurved
Number of ± rectangular alar cells in the row along the margin	2–4	4–15
Pseudoparaphyllia	small, broadly lanceolate to ovate	larger, narrowly lanceolate to filiform
Spore size (μm)	8–12	12–16

tion. JK revised the specimen as *H. recurvatum* but being somewhat uncertain about the identification, asked another expert – Heribert Köckinger from Austria – for confirmation of the revision. HK, however, confirmed both *H. recurvatum* and *H. sauteri* having been mixed in the specimen. *H. sauteri* has thus been recorded for the first time from the Czech Republic. *H. recurvatum* has been listed among the doubtful taxa of the Czech Republic (Váňa 1997), but its occurrence has nevertheless been strongly suspected (cf. annotation 94 in Váňa 1998). It has been mentioned by Hein (1874) from the surroundings of Karlova Studánka in the Hrubý Jeseník Mts but his record is extremely uncertain (an unreliable author, and improbable ecology), and the herbarium record probably does not exist. Another report was made by Ando (1973) who mentioned this species among the accompanying species in the exsiccate of *Campylophyllum halleri* (Rabenhorst, Bryotheca Europaea Nr. 146: Nieder-Lindenwiese im Gesenke [nowadays Lipová-Lázně in the Hrubý Jeseník Mts.], leg. J. Milde). As the locality was erroneously assigned to Germany, the record was overlooked during the compilation of data for the last version of the check-list (Váňa 1997).

Both newly recorded species of *Hypnum* belong to the section *Revolutohypnum*, together with *H. pallescens*, *H. revolutum* and *H. vaucheri* (Ando 1973). The two species are characterized in the section by the entire and non-recurved leaf margins, as well as lanceolate to filiform pseudoparaphyllia. *H. sauteri* differs from *H. recurvatum* as indicated in Table 1 (see also Fig. 1). In addition, both species differ markedly in habit, i.e. the way in which the leaves are recurved and arranged along the stem (Fig. 1).

H. recurvatum is rather broadly distributed in the Northern Hemisphere – in addition to the montane and boreal regions of Europe (Pyrenees, Alpes, Jura, Carpathians, Fennoscandia, European part of the former USSR, Ural and Caucasus) it is known from Siberia and Mongolia in Asia, and from North America and Greenland. *H. sauteri* is a European endemic, known until now only from the Alps, Western Carpathians, Jura Mts and northern Norway (Ando 1973, Ignatov & Afonina 1992, Kubinská et al. 2001).

The ecology of both taxa is rather similar – they normally grow on basic, usually calcareous rocks in upland regions, mostly in montane and subalpine belts but sometimes encroaching on the alpine zone. Notable is their common occurrence with *Campylophyllum halleri* (H. Köckinger, pers. comm.); the new site in the Krkonoše Mts being no exception.

Details of the new locality of *H. sauteri* and *H. recurvatum* are as follows:

Czech Republic, Krkonoše Mts: Obří důl, valley of Rudný potok brook, calcareous rocks at the left bank [S-42 grid: E3551.80, N5622.52; WGS-84: 50°43.84' – 15°43.91'] at ca. 1100 m a.s.l., Aug 1998 coll. P. Hájek, herb. P. Hájek

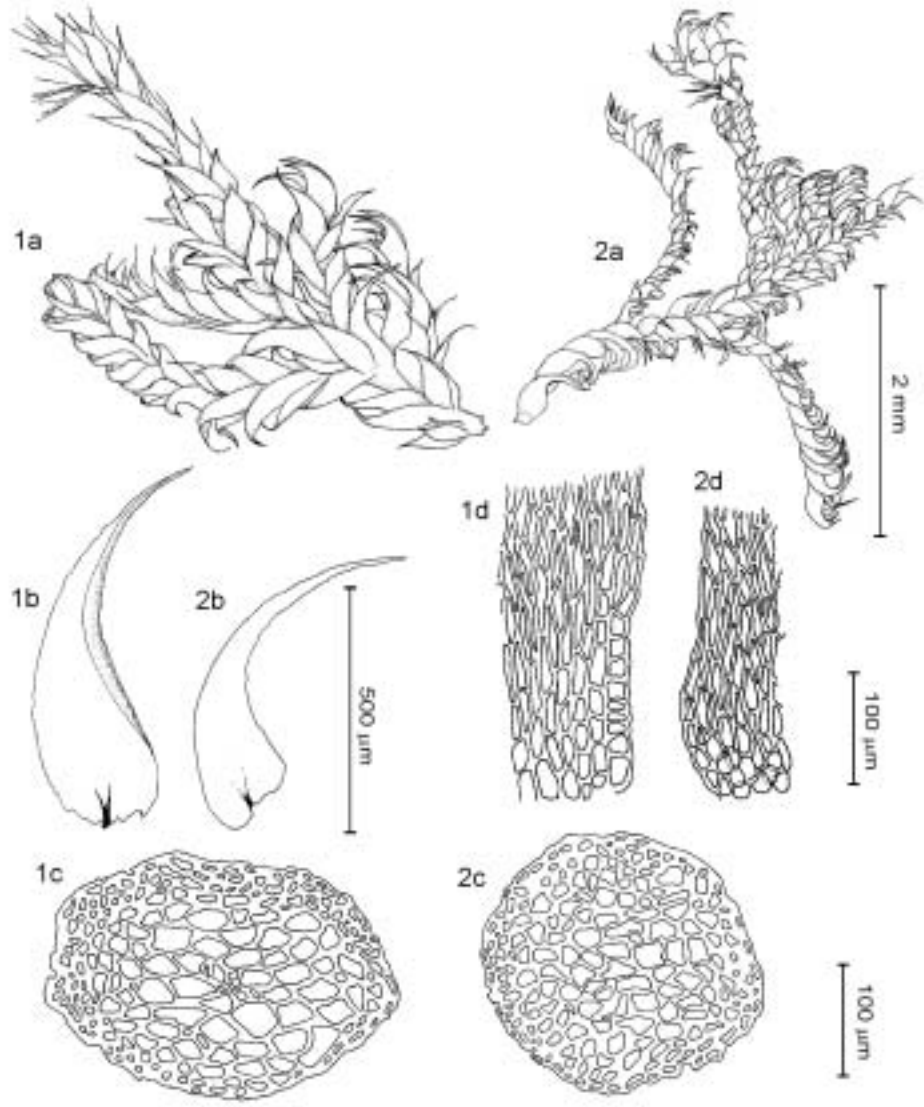

Fig. 1. – *Hypnum recurvatum* (1) and *Hypnum sauteri* (2) after plants from the new locality. a – habit sketch, b – branch leaf, c – cross-section of stem, d – alar cells of branch leaf (orig. Z. Hradílek).

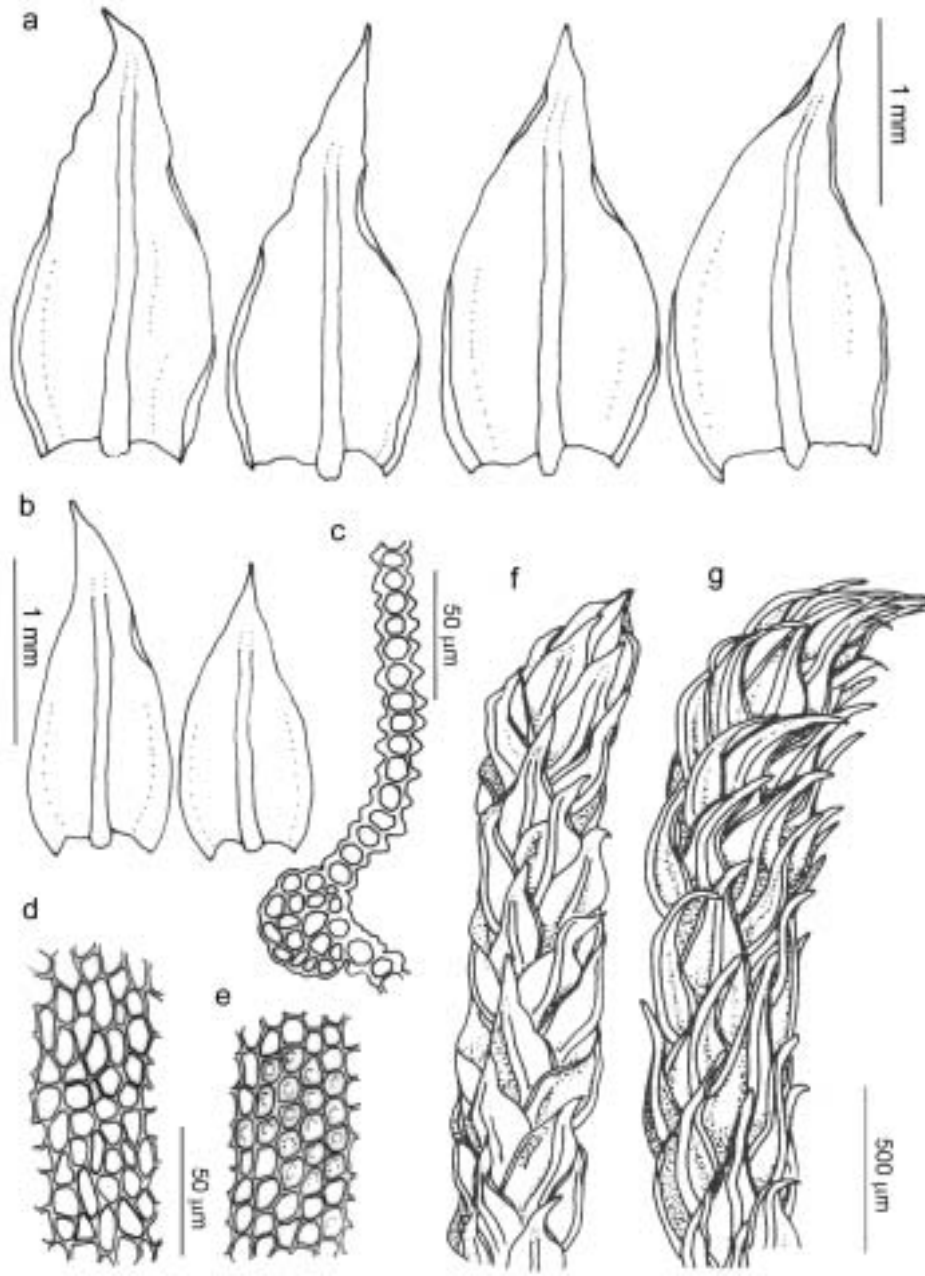

Fig. 2. – *Lescuraea patens* (a-f, Kučera 9578) and *L. incurvata* (g, Buryová 2909). a – stem leaves, b – branch leaves, c – leaf cross-section, d – leaf cells from the upper third of the leaf, e – leaf cells from the lower third of the leaf, f – habit, g – habit of *L. incurvata* (orig. B. Buryová).

Several sporophytes were found on the plants of *H. recurvatum*; one sporophyte was present in *H. sauteri*, too. Both *Hypnum* species grew in one stand mixed together with *Campylophyllum halleri*, *Pseudoleskeella catenulata*, *Brachythecium velutinum*, *Tortella tortuosa* and *Schistidium robustum*.

Both *Hypnum* species were collected from a small patch at first and since then they have been repeatedly searched for at the locality in September 2001 and September 2002, unfortunately without success. As the original collection was not made consciously, the actual details of the site are not completely known and we are thus not able to state that the species are not growing at the locality any more. However, even if they survived their first collection, their populations must be extremely small in size and highly vulnerable to future catastrophic events, which means that they both should be evaluated as critically endangered according to the criteria B1+2a,b[iii], C2a[i] of IUCN 3.1 categories (IUCN 2001) in the next Red List evaluation.

Lescuraea patens

Lescuraea patens was first collected in the cirque Velká Kotelní jáma on the SE slopes of Mt Kotel in the western Krkonoše Mts but was not recognized in the field. The species was at first identified after the microscopic examination of *Lescuraea* plants accompanying other species collected at the site. The first specimen was not the only one – the determination of the 2001 collections yielded three other sites for the species in the cirque.

As the species was not recognized in the field, and therefore the populations not measured nor relevés recorded, the site was revisited on 2nd September 2002 in order to relocate and perhaps find additional populations of the species. Two such populations have indeed been found, one of them (Kučera 9578) probably identical with the population found the year before, though the recorded accompanying species were not identical. The difficulty in field recognition can best be illustrated by the fact that six(!) additional collections of *L. patens.* have been made during 2002 in the Krkonoše Mts, which have only been recognized upon subsequent microscopic examination. The list of hitherto recorded localities follows:

Krkonoše Mts, **Velká Kotelní jáma cirque**: the westernmost ravine beneath the cirque face, near the old adit entrance, 245 m ESE of the top of Mt Kotel [S-42 grid: E3537.73, N5624.77. – WGS-84: N50°45.12', E15°31.97'], alt. 1345 m a.s.l., on face of a siliceous boulder, ass. with *Grimmia hartmanii*, 15. 6. 2001 coll. M. Zmrhalová, herb. SUM no. B4083. – Bottom of the cirque, at the right side of the brook, 490 m ESE of the top of Mt Kotel [S-42 grid: E3537.97, N5624.64 – WGS-84: N50°45.04', E15°32.17'], on small stones in field depression – late snow area, 1160 m a.s.l., 16. 6. 2001 coll. B. Buryová, herb. B. Buryová no. 2678. – Bottom of the cirque, near the confluence of brooklets, 460 m ESE of the top of Mt Kotel [S-42 grid: E3537.95, N5624.69 – WGS-84: N50°45.07', E15°32.16'], on small shaded base-rich (probably erlan) siliceous stone beneath tall herbs (associated with *Trichostomum tenuirostre* and *Radula lindenbergiana*), 1170 m a.s.l., 16. 6. 2001 coll. J. Kučera, herb. J. Kučera no. 8070, 2. 9. 2002 coll. J. Kučera, no. 9578. – Bottom of the cirque, at the right side of the brook, [S-42 grid: E3538.00, N5624.61 – WGS-84: N50°45.03', E15°32.20'], horizontally on small gneiss stone beneath the blueberries in SSE slope, 1150 m a.s.l., 2. 9. 2002 coll. M. Zmrhalová, herb. SUM no. B4462. – Krkonoše Mts, **Malá Kotelní jáma cirque**: 230 m SE of the summit of Mt Kotel [S-42 grid: E3537.70, N5624.68 – WGS84 N50°45.07', E15°31.94'], 1330 m a.s.l., on inclined SE face of a siliceous stone in a spring site, moist, shaded, ass. with *Brachythecium starkei*, *B. populeum* 31. 8. 2002 coll. M. Zmrhalová, herb. SUM no. B4461. – Krkonoše Mts, **Labský důl valley**: Pančavská jáma cirque: E facing slope of so-called 'Schustlerova zahrádka', 300 m ENE of the view-point 'Ambrožova vyhlídka', ca. 780 m SSE of the chalet Labská bouda [S-42 grid: E3538.90, N5626.04 – WGS-84: N50°45.80', E15°32.97'], 1075 m a.s.l. On inclined face of a granite stone, sheltered by tall ferns (*Athyrium distentifolium*), E-facing, dry, half-shaded, no humus layer, 12. 9. 2002 coll. J. Kučera, herb.

J. Kučera no. 9579. – Dtto (same coordinates), E-facing stone, inclined face, wet, half-shaded, no humus layer, ass. with *Lophozia hatcheri*, *Lophozia barbata*, *Lescuraea incurvata*, *Grimmia hartmanii*, *Trichostomum tenuirostre*, 12. 9. 2002 coll. M. Zmrhalová, herb. SUM no. B4463. – Pančavská jáma cirque: E facing slope of so-called 'Schustlerova zahrádka', 260 m ENE of the view-point 'Ambrožova vyhlídka', ca. 780 m SSE of the chalet Labská bouda [S-42 grid: E3538.87, N5626.03 – WGS-84: N50°45.79', E15°32.95'], 1090 m a.s.l., on vertical face of a siliceous boulder, SE-facing, slightly shaded, ass. with *Trichostomum tenuirostre*, *Lescuraea incurvata*, *Brachythecium geheebii*, *Bryum elegans*, *Lophozia hatcheri*; 12. 9. 2002 coll. M. Zmrhalová, herb. SUM no. B4464. – Pančavská jáma cirque: E-facing slope N of the stream of Pančava, 110 m SE of the view-point 'Ambrožova vyhlídka' and 115 m NE of the view-point 'Pančavská vyhlídka' on the top of the waterfall [E3538.68-N5625.87 – WGS-84: N50°45.71', E15°32.78'], 1200 m a.s.l., granite stone face in E slope shaded by vegetation, ass. with *Chiloscyphus profundus*, 12. 9. 2002 coll. B. Buryová, herb. B. Buryová no. 2901. – Krkonoše Mts, **Úpská jáma cirque**: Uppermost course of Úpa above the waterfall, left bank, ca. 20 m above the bridge over the stream, 1,25 km NNE of the summit of Mt Studniční hora [S-42: E3550.65, N5623.11 – WGS-84: N50°44.16', E15°42.94'], 1370 m a.s.l., on slightly inclined shaded moist E face of a granite stone beneath vegetation, ass. with *Cynodontium polycarpon*, *Lescuraea incurvata*, *Brachythecium reflexum* 26. 7. 2002 coll. M. Zmrhalová, herb. SUM no. B4460.

Table 2. – Relevés of synusia accompanying *Lescuraea patens*. Species covers (%) are given.

	Kučera 9578	Kučera 9579
Relevé size (cm)	30 × 30	40 × 30
Substrate	erlan stone, inclined face	granite stone, inclined face
Ecological conditions of the site	E-exposed, very thin humus layer, slightly wet, half-shaded	E-exposed, no humus layer, dry, half-shaded
Lescuraea patens	12	42
Grimmia hartmanii	–	9
Paraleucobryum longifolium	–	3
Dicranum scoparium	–	1
Dicranoweisia crispula	5	–
Trichostomum tenuirostre	20	–
Racomitrium sudeticum	7	–

Two relevés have been recorded at the sites to illustrate the site conditions (Table 2). The whole respective populations of *L. patens* were included.

L. patens is widely distributed in the Northern Hemisphere – North America, Europe (Lawton 1957), Caucasus, Siberia, Middle Asian mountains (Ignatov & Afonina 1992), although nearly everywhere it is found rather scarcely. This might be partly due to the substantial overall similarity in habit shared with the common species *L incurvata*. Moreover, the ecology of both species seems to be very similar except for the fact that *L. incurvata* is more widely distributed in terms of the altitudinal span, growing from lowlands to the upper alpine zone, while *L. patens* has until now only been found in the subalpine and alpine zones. Both species grow on more or less basic stones (typically rather small stones or sometimes boulders, commonly under tall herbs, probably always in places covered with snow during winter), ranging from slightly basic siliceous rocks like schists to pure limestone but sometimes found even on obviously completely acidic granite – here probably influenced by the supply of bases from the surroundings. The Czech occurrences seem to conform with those rules. The species was always recorded on siliceous but sometimes obviously base-rich stones sheltered by taller herbs between 1070 and 1370 m a.s.l., which roughly reflects the altitudinal span of the glacial cirques.

L. patens has never been recorded or even expected to occur in the Czech Republic. The occurrence in the former Czechoslovakia was believed to be restricted to the Tatra Mts

(Pilous & Duda 1960), where it is obviously rare or under-recorded, as evidenced by the Endangered status in the last version of the Slovak Check- and Red List of bryophytes (Kubinská et al. 2001). The occurrence in Poland is likewise presumably restricted to the High Tatras (Szafran 1961); the species is known there only from a single locality, where it was found in the 1950s. The species is rather easily known microscopically by the presence of large central papillae on both sides of cells in the leaf (Fig. 2e), which differentiate it from *L. incurvata*, which bears only scattered, low papillae, which are never in the central position. The recognition in the field might be difficult, though in most cases possible, by the leaves not recurved in the upper part, not tending to be homomallous (cf. Fig. 2f, g); the appearance is very similar to that of a large *Leskea polycarpa*, which, however, has the leaf margins flat or only little recurved below, the leaf apex more shortly pointed, and the papillae restricted to the dorsal side of the leaf.

Lescuraea patens must be definitely considered highly endangered, as the discovered populations were extremely small and thus vulnerable to possible catastrophic events like regular avalanches. The three measured populations account for ca. 7 dm^2; the rest of the populations, which have not been measured could account for about a similar area, totalling thus some 15 dm^2. Several other populations may be found in future but based on the results of this year's detailed and focused survey in all our glacial cirques of the Krkonoše and Hrubý Jeseník Mts, the species is indeed extremely rare. Therefore, criterion C2a[i] of IUCN (2001) can be applied to our populations qualifying the species for the Critically Endangered category.

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Souhrn

V roce 1998 byly během bryologického výzkumu vápencových výchozů Krkonoš na lokalitě Rudník v Krkonoších (JZ svah Sněžky) nalezeny druhy *Hypnum recurvatum* a *Hypnum sauteri*, rostoucí společně na jediném místě. *H. sauteri* je nově zjištěným druhem v bryoflóře ČR, druh *H. recurvatum* byl z našeho území již publikován (Ando 1973) z okolí Lipové-Lázní v Hrubém Jeseníku, údaj však byl dosud opomíjen vzhledem k mylnému umístění německy pojmenované lokality do Německa. Další údaj (Heinův) o výskytu *H. recurvatum* v širším okolí Opavy je pro absenci herbářového dokladu považován za pochybný. Ani při opakovaném terénním průzkumu lokality v letech 2001 a 2002 nebyl zatím výskyt obou druhů znovu potvrzen, snad pro nepřesnou lokalizaci původního nálezu z roku 1998. *Lescuraea patens* byla poprvé na našem území objevena v roce 2001 při systematickém průzkumu Velké Kotelní jámy v Krkonoších na dvou blízkých mikrolokalitách. V následujícím roce pak byl druh zjištěn i v Malé Kotelní jámě, na několika místech Pančavské jámy v Labském dole a v Úpské jámě. Populace *L. patens* byly zaměřeny a zdokumentovány pro budoucí monitoring. Dosud zjištěné populace jsou velmi malé a zranitelné, proto je navrhováno zařazení mezi kriticky ohrožené druhy naší flóry ve smyslu kategorií IUCN.

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