

PRELIMINARY DATA ON DISTRIBUTION AND IDENTIFICATION OF *DIPHASIASTRUM* × *ZEILLERI* (ROUY) HOLUB IN LITHUANIA
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Abstract

Tupčiauskaitė J., Žemgulytė T., 2012: Preliminary data on distribution and identification of *Diphasiastrum* × *zeilleri* (Rouy) Holub in Lithuania [Pirminiai duomenys apie *Diphasiastrum* × *zeilleri* (Rouy) Holub paplitimą ir identifikavimą Lietuvoje]. – Bot. Lith., 18(2): 147–153.

The paper presents preliminary data on distribution of *Diphasiastrum* × *zeilleri* in Lithuania based on the collections of Vilnius University Herbarium (WI) and the data of Polish herbaria. According to these data, 25 localities of *Diphasiastrum* × *zeilleri* were revealed. The description of *Diphasiastrum* × *zeilleri*, the list of its specimens from WI collections, the pictures of typical embranchment of these species and the dorsal and ventral sides of branches from the Herbarium collections, the identification key of *Diphasiastrum complanatum*, *D. tristachyum*, *D. × zeilleri* were analysed. WI *Diphasiastrum* genus collection includes: *D. complanatum* (46 branches, 19 herbarium sheets), *D. × zeilleri* (33 branches, 17 herbarium sheets) and *D. tristachyum* (21 branches, 7 herbarium sheets), specimens.

Keywords: *Diphasiastrum* × *zeilleri*, distribution, identification key, Lithuania.

INTRODUCTION

East Prussian botanist C. Sanio was the first author to describe *Diphasiastrum* × *zeilleri* as a variety in Germany in 1881 (RAUSCHERT, 1967). Thus, the plants of this species were noticed in the region of the East Baltic Sea long ago. However, at the rank of species, *D. × zeilleri* was accepted only 50 years ago (DAMBOLT, 1963). Naturally, the distribution area of the species is inadequately known (KUKKONEN, 2000). In the East Baltic (GAVRILOVA & ŠULC, 1999; TUPČIAUSKAITĖ, ŽEMGULYTĖ, 2010) and East European (IVANENKO & CVELEV, 2004; DMITRIEVA, 2009) countries, *D. × zeilleri* gained a wider recognition at the end of the 20th century – the beginning of the 21st century. We present the species nomenclature citations, description of morphological characteristics and distribution area.

The intermediate forms between two ground ce-

dar species belonging to the *Diphasiastrum* Holub genus – *Diphasiastrum complanatum* (L.) Holub and *Diphasiastrum tristachyum* (Pursh) Holub were recorded in Lithuania already in the middle of the 20th century (MINKEVIČIUS, 1959), though they were not identified as separate species. At the end of the 20th century, in the *Flora of the Baltic Countries* such intermediate forms were attributed to the hybridogenous species *Diphasiastrum* × *zeilleri* (Rouy) Holub (EGLIŠE et al., 1993). However, neither the identification of this species, nor data on its prevalence in the Baltic countries were presented. In 1999, *D. × zeilleri* were recorded in Labanoras Forest (Eastern Lithuania). Thus, a taxonomic revision of the collection of *Diphasiastrum* specimens was performed at Vilnius University Herbarium (WI) to ascertain preliminary distribution of *Di. × zeilleri* in Lithuania. The published data on *D. × zeilleri* from Lithuania in Polish herbaria (PACZYNA, 1972) were used additionally.

STUDY OBJECT

We treated *D. × zeilleri* after DOSTÁL (1984), KUKKONEN (2000), IVANENKO & CVELEV (2004).

Diphasiastrum × zeilleri (Rouy) Holub, Preslia, 47: 108 (1975). – Basion. *Lycopodium complanatum* L. Race *L. zeilleri* Rouy, Fl. France 14: 491 (1913). – *Lycopodium complanatum* L. var. *intermedium* A. Braun in Mutel, Fl. France, 4: 192 (1837). – *Diphasium zeilleri* (Rouy) Damboldt, Ber. Bayer. Bot. Ges., 36: 26 (1963). – *Diphasium complanatum* (L.) Rothm. subsp. *zeilleri* (Rouy) Pacyna, Fragm. Fl. Geob., 18 (3–4): 322 (1972). – *Lycopodium zeilleri* (Rouy) Greuter & Burdet, Willdenowia, 10: 229 (1980). – *Diphasiastrum complanatum* Holub subsp. *zeilleri* (Rouy) Kukkonen, Acta Bot. Fenn., 23 (3): 265 (1986).

Stem creeping, usually subterranean, covered with spatulate leaves, up to 40 cm in length and 2–4 mm in diameter, found in 1–10 cm depth. Vertical 10–30 cm shoots grow from the stem. Shoots

abundantly dichotomously branched, form an obconic sparse tuft. Branches fork at a 30°–35° angle of unequal length, the upper side greyish- or bluish-green, underneath yellowish-green and slightly pruinose, with long internodes, flat, (1.5)1.7 to 2.5 mm wide, clearly anisophyllous. Lateral leaves appressed or slightly deflexed, narrowly triangular, usually falcate towards the branch. Their adaxial inside is channelled; abaxial side is relatively high and narrowly keeled. Wing of the branch extending the leaf is rather broad, so the branch is clearly flat. Dorsal leaves narrowly lanceolate or nearly linear, about the same width as the dorsal side of lateral leaves. Ventral side of the branch is clearly different from the dorsal. Ventral leaves lanceolate, smaller than the dorsal, adnate part is less pronounced than that of the dorsal. Non-adnate parts are appressed or slightly deflexed, 1–2 mm long, as wide as a quarter of winged branch, 2–3 times shorter than internode, only the very apex of annual shoot reaches the base of another leaf. Cones grow on the apex of central branch,

Table 1. Key for identification of *Diphasiastrum complanatum*

Character	<i>D. complanatum</i>	<i>D. tristachyum</i> , <i>D. × zeilleri</i>
Sterile branches of above-ground orthotropic shoots	Fanlike distantly spaced	Dense, form tufts
a) upper side	Bright green (without pruinose or waxy bloom)	Greyish- or glaucous-green
b) under side	Yellowish green (non-pruinose)	Usually pruinose, therefore, slightly whitish
Form of branches	Clearly flattened	Indistinctly flattened or quadrangular
Diameter of branches	(1.4) 1.5–3 (4) mm	1–2.5 mm
Lateral leaves of branches	Usually clearly deflexed	Appressed or only slightly deflexed
Abaxial side of lateral leaf and internode wing	With high and narrow keel	Not so high and narrow or ovate
Dorsal leaves	Narrower than upper side of lateral leaves	Almost of the same width as upper side of lateral leaves
Adnate part of ventral leaves	Invisible or indistinct	Distinct
Non-adnate part of ventral leaves	Very small, (0.5) 0.8–1.5 (1.8) mm in length, triangular, by the base abruptly enlarged, make up (1/4) 1/5–1/6 of branch width. Shorter than 1/2 of internode length (make up 1/5–1/3 of the distance between two ventral leaves)	Larger, (1) 2–2.5 mm in length, triangular, towards the base gradually widening or broadly lanceolate, by the base make up 1/2–1/4 of branch width. Almost always longer than 1/2 of internode length
Central shoot	Usually sterile, strobili grow on lateral shoots	Usually central and lateral shoots fertile
Cone peduncle	Long, usually 1–2 times dichotomous	Long, usually 2–3 times dichotomous
Sporophylls	Usually broadly ovate, abruptly acuminate	Usually ovate, with longer acumen
Rhizome-like plagiotropic shoot	Green aboveground or shallowly subterranean	Usually subterranean, without chlorophyll
Orthotropic shoot branching off from plagiotropic in the underground part	Emergent, usually up to 3 cm in length, leaves lanceolate, rarely spatulate, or overground	More or less erect, usually 3–12 cm in length, leaves spatulate, with membranous margins

rarely of larger lateral branches. They are 1.5 to 3 cm in length; grow by 2–4(6) on 4–9 cm long peduncles. Sporophylls broadly ovate or cordate, abruptly acuminate. Sporulate in July–August (September). Chamaephyte grows in light, sandy pine forests.

The range – Central and Eastern Europe, the Baltic States, Western Siberia, North America (Eastern).

MATERIALS AND METHODS

Firstly, a key for the identification of the *Diphasiastrum* species was compiled. We used the literature data on identification of the *Diphasiastrum* genus (RAUSCHERT, 1967; PACYNA, 1972; IVANENKO & CVELLEV, 2004) and common vascular flora (DOSTÁL, 1984;

KUKKONEN, 2000; FISCHER & LOBIN, 1995; ROTHMALER et al., 2005). Using this key (Tables 1–2) and illustrations of the diagnostic features of species in the above-mentioned works, we revised 100 *Diphasiastrum* specimens distributed by 1–6 individuals on 41 herbarium sheets: *D. complanatum* – 65 specimens (29 herbarium sheets), *D. tristachyum* – 34 (11 herbarium sheets), *D. × zeilleri* – 1 (1 herbarium sheet). The examined specimens were collected in 1922–2005, mostly in the pine forests of the southern and eastern Lithuania. WI herbarium specimen images (Fig. 1–2) illustrating important features of plant branching types as well as dorsal and ventral sides of vegetative branches were submitted. The specimens of this species collected in the eastern Lithuania in 1930–1939 are deposited at the Polish herbaria (PACZYNA, 1972), therefore, the distribution in Lithuania

Table 2. Key for identification of *Diphasiastrum tristachyum* and *Diphasiastrum × zeilleri*

Character	<i>D. tristachyum</i>	<i>D. × zeilleri</i>
Sterile branches of orthotropic shoots	Equal length, form dense obconic tuft	Unequal length, form looser, larger, not always conic tuft
a) upper side	Dark greyish- or glaucous-green	Greyish- or glaucous-green
b) under side	Markedly pruinose	Non-pruinose or slightly pruinose
Dorsal and ventral side of the branch	Almost equal	Distinctly different
Shape of branches	Narrow, rounded quadrangular, both sides markedly prominent, almost isophyllous	Broader, slightly flattened, both sides less prominent, clearly anisophyllous
Diameter of branches	(1) 1.5–1.8 (2) mm	(1.5) 1.7–2.5 mm
Lateral leaves	Usually strongly appressed	More loosely appressed or deflexed
Non-adnate parts of lateral leaves	Almost parallel or apexes are close on ventral side, narrow	Usually falcate deflexed
Abaxial side of the lateral leaf and internode wing	Roundish, wide, short	With tall and narrow keel
Non-adnate part of ventral leaves	Wide, lanceolate, wider than upper side of lateral leaves	Narrow lanceolate to almost linear, approximately as wide as upper side of lateral leaves
Leaf base	Usually exceeds ½ of branch width	Does not exceed ½ of branch width
Adnate part of ventral leaves	As distinct as on dorsal	Less distinct as on dorsal
Internodes of branches	Relatively short	Relatively long
Non-adnate part of ventral leaves	Large, make up ¾ of the distance between two ventral leaves	Comparatively small, make up (1/2) 1/3 of the distance between two ventral leaves
The basis of non-adnate part of ventral leaves	Wide comparing with branch width, reaches (½) 1/3 of width of narrowly winged branch	Narrow, reaches about ¼ of width of winged branch
Ventral leaves beside the top of the annual shoot	Overlap the basis of the other leaf	Only apical leaves reach the basis of the other leaf
Cone peduncle	Usually 2–3 times dichotomous	Usually 2 times dichotomous
Sporophylls	Long acuminate	With shorter acumen
Rhizome-like plagiotropic shoot	Subterranean, in the depth of (3)5–10(20) cm	Usually subterranean, grows in the depth of (0)5 (10) cm

Table 3. Studied specimens of *Diphasiastrum × zeilleri* deposited at the Herbarium of Vilnius University (WI). Name of taxa before taxonomic revision; n – number of branches; d. – district; NP – National Park

Name of taxa	Locality, habitat	Date	Collector, identifier	Number of branches
<i>Lycopodium complanatum</i> L.	Kaunas d., (envir.?) Vaišvydava forest	15 Sept. 1925	A. Minkevičius	4
<i>L. complanatum</i> L. var. <i>anceps</i> Wallr.	Jurbarkas	18 Sept. 1928	Leg. K. Jablonskis Det. A. Minkevičius*	2
<i>L. complanatum</i> L. var. <i>anceps</i> Wallr.	Jurbarkas forest enterprise, Šilinė forestry, forest block 36, Tauragė d. Pine forest	7 July 1931	Leg. J. Valickis Det. A. Minkevičius	1
<i>L. complanatum</i> L.	Kaunas d., Gaižiūnai (currently Jonava d.). Forest	18 August 1931	J. Dagys	1
<i>L. complanatum</i> L.	Švenčionėliai d., Salos vil. (currently Ignalina d.). Pine forest	9 August 1958	L. Šidla	2
<i>L. tristachyum</i> Pursh	Molėtai d., vicinity of Lake Juodieji Lakajai. Thinned out pine forest	17 July 1960	A. Minkevičius	4
<i>L. tristachyum</i> Pursh	Surroundings of Ružiškės, between Nemenčinė and Pabradė (currently Vilnius d.). Pine forest	12 August 1961	A. Minkevičius	4
<i>L. anceps</i> Wallr.	Labanoras Forest, between Stirniai and Labanoras (currently Molėtai d.). Pine forest	23 August 1962	A. Minkevičius	3
<i>Diphasium tristachyum</i> (Pursh) Rothm.	Ignalina d., surroundings of Ripelialaukis, near Lake Jaskutis. Pine forest	24 June 1965	Leg. M. Natkevičaitė- Ivanauskienė Det. R. Bandžulienė	2
<i>Lycopodium complanatum</i> L.	Švenčionys d., near Lake Ešerinis	23 June 1966	Leg. Initial 'D' Det. A. Minkevičius*	1
<i>L. complanatum</i> L.	Molėtai d., near Tartokas–Stirniai road. Forest	15 July 1966	L. Banytė	1
<i>L. tristachyum</i> Pursh	Ignalina d., NP (currently Aukštaitija NP), near Lake Dringis. Forest	10 July 1976	Z. Vaitkevičiūtė	2
<i>L. tristachyum</i> Pursh	Ignalina NP (currently Aukštaitija NP), Ažvinčiai forest	9 July 1983	R. Mečelytė	1
<i>Diphasium complanatum</i> (L.) Rothm.	Kelmė d., surroundings of Šaukėnai, near Lake Ilgežeris pothole. Pine forest	24 May 1994	Leg. R. Tamulaitis Det. J. Tupčiauskaitė	1
<i>Diphasiastrum × zeilleri</i> (Rouy) Holub	Švenčionys d., about 4 km to the southwest of Labanoras. Pine forest	20 July 1999	J. Tupčiauskaitė	1
<i>D. complanatum</i> (L.) Holub	Švenčionys d., Labanoras, Forest block 216 (107), sub-block 6. Mature pine forest	1 July 2000	J. Tupčiauskaitė	1
<i>D. complanatum</i> (L.) Holub	Švenčionys d., near Lake Ešerinis. Mature pine forest	27 July 2001	J. Tupčiauskaitė	2

* Label of the herbarium specimen is written by Prof. A. Minkevičius, however, the name of identifier is not given.

is indicated by including the data from these collections as well.

RESULTS AND DISCUSSION

Taxonomic revision of *Diphasiastrum* specimens collection showed that the highest number of specimens were assigned to the species *D. complanatum* (46 specimens in 19 herbarium sheets), followed by *D. × zeilleri* (33 specimens in 17 herbarium sheets), in the third place *D. tristachyum* (21 specimens in 7 herbarium sheets).

In *D. complanatum* collection 19 specimens (11 herbarium sheets) were identified as *D. × zeilleri*, in *D. tristachyum* – 13 (5 herbarium sheets). Therefore, *D. complanatum* and *D. tristachyum* species collections included about a third of *D. × zeilleri* specimens. Also one of herbarium sheets of each species was mixed – it included branches of *D. × zeilleri* and one more species. *D. × zeilleri* specimens (Table 3) were collected in 1925–2001.

The literature references (HOLUB, 1975) and our research data show that the identification of *Diphasiastrum* species present serious difficulties, since there are not only well distinguished morphologically different types of individuals, but also typical transitional forms, the identification and classification of which is problematic. Especially typical *D. × zeilleri* specimens

(8 branches) were found in seven herbarium sheets. Their position No. 3, 4, 10, 13, 15–17 (Table 3). In our opinion, typical specimens (6 branches) were in three more herbarium sheets (No. 6, 11, 14) and rather typical – in the remaining seven (19 branches). There is no doubt for their assignment to *D. × zeilleri* species. However, six herbarium sheets with 14 branches, which also had some characters of *D. × zeilleri*, were included into the *D. complanatum* species collection (WI No. 12, 13, 17, 20, 30, 35). Therefore, *D. complanatum* collection was the most heterogeneous, while the remaining *D. tristachyum* specimens varied comparatively little. Typical specimens of *Diphasiastrum* species are presented in Fig. 1–2.

Based on WI and Polish herbaria data, *D. × zeilleri* in Lithuania has been recorded in eleven administrative districts. A total of 25 localities are known: 17 localities and nine districts (WI herbarium data) and eight localities and two new districts – Trakai and Šalčininkai (Polish herbaria data) (Table 4). They are concentrated in the northeastern part of the country: Švenčionys distr. (7 localities), Ignalina distr. (5), Molėtai and Vilnius distr. (3 in each). In the remaining areas, only one locality in each district is known. In Švenčionys district, the localities are concentrated in the surroundings of Kanis mire (4 localities), where particularly typical *D. × zeilleri* individuals occur (Fig. 1–2, b). Furthermore, three localities in

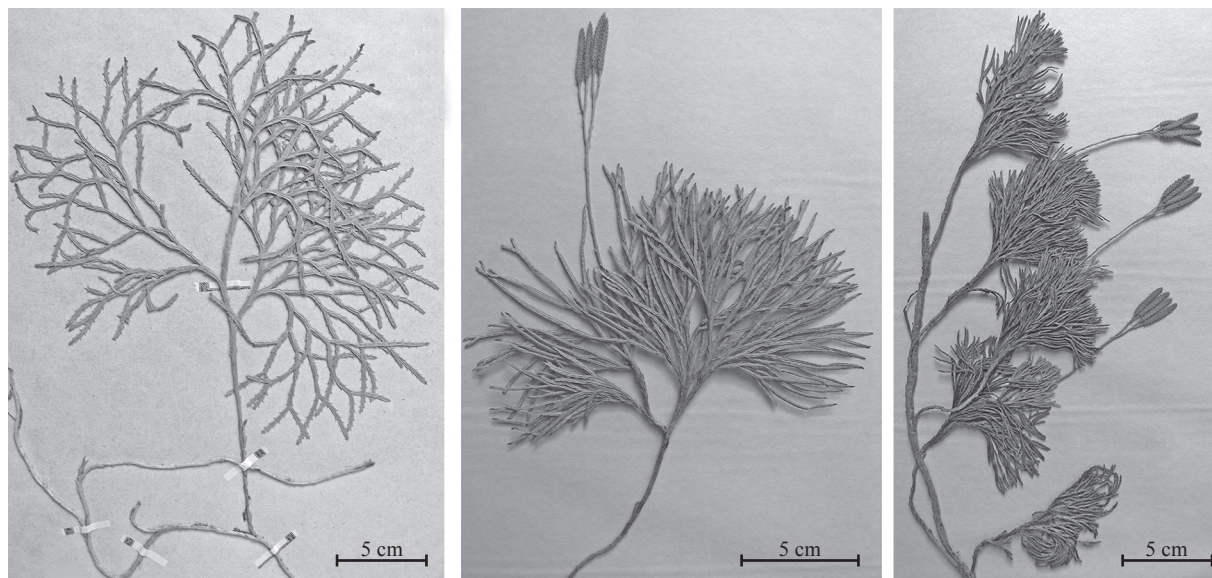


Fig. 1. Samples of branching types of *Diphasiastrum* (WI specimens): a – *D. complanatum* (Juodupė, 2 August 1926); b – *D. × zeilleri* (Labanoras envir., Švenčionys distr., J. Tupčiauskaitė, 1 July 2000); c – *D. tristachyum* (Birštonas, Prienai distr., C. Regel, July 1927)

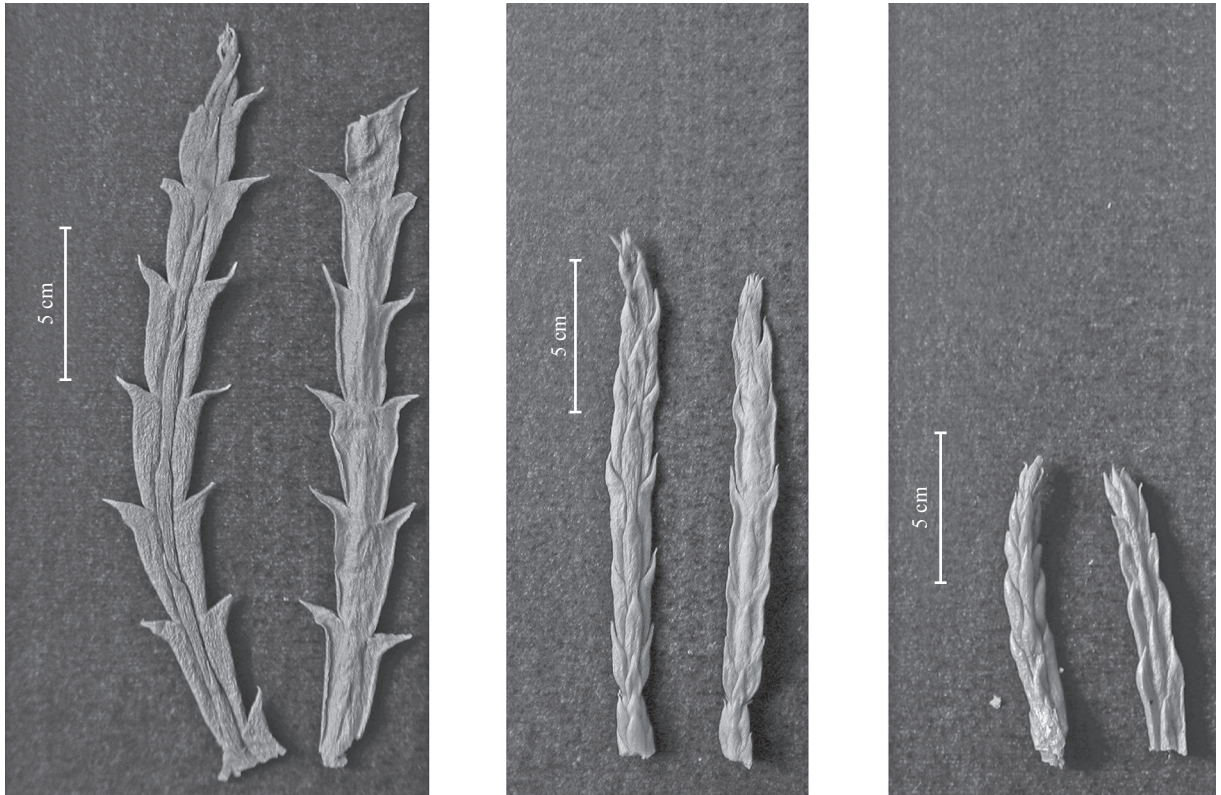


Fig. 2. Dorsal and ventral sides of typical branches of *Diphasiastrum* species: a – *D. complanatum*, b – *D. × zeilleri*, c – *D. tristachyum* (herbarium specimens indicated in Fig. 1)

Table 4. *Diphasiastrum × zeilleri* localities in Eastern Lithuania according to the Polish herbaria data. d. – district

Locality (PACYNA, 1972)	Year	Collector	Herbarium	Current name of locality
Nadl. Niemenczyn	1930	J. Sieleżyński	WI	Vilnius d. Nemenčinė
Wileńszczyzna, wzgórze koło Pohulanki	1932	F. Krawiec	POZ	Vilnius city (cf. PACYNA, 1972)
Lesń. zwierzynieckie, gm. Rudziszki, koło Lipniak	1933	J. Limanowska	KRAM	Trakai d. Rūdiškės envir.
Puszcza Rudnicka	1934	I. Dąbkowska	KRAM	Šalčininkai d. Rūdininkai forest
Podumie	1936	I. Dąbkowska	KRAM	Švenčionys d. Padūmė vill.
Borynovo (pow. święciański)	1937	I. Dąbkowska.	KRAM	Švenčionys d. Baranava
Woj. wileńskie, stacja Dukszty	1938	A. Stefanowski	WI	Ignalina d. Dūkštas railway station
Januliszki, nad jeziorem Petražoris	1939	I. Dąbkowska	KRAM	Švenčionys d. Januliškis vill., by Lake Petražeris

this area are known from the Polish herbaria data. These localities were reported in the Girutiškis Strict Nature Reserve or near its boundary, in the environs of Januliškis village.

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REFERENCES

- DAMBOLDT J., 1963: Zur Kenntnis der Flachen Bär-lappe in Bayern. – Berichte der Bayerischen Botanischen Gesellschaft, 36: 25–28.
- DMITRIEVA S. A., 2009: *Lycopodiaceae* P. Beauv. ex Mirb. – In: PARFENOV V. I. (ed.), Flora Belarusi. Sosudistye rasteniâ, 1: 38–47. – Minsk.
- DOSTÁL J., 1984: *Lycopsidea*. – In: KRAMER K. U. (ed.), HEGI G., Illustrierte Flora von Mitteleuropa, 1(1):

- 16–54. – Berlin–Hamburg.
- EGLITE Z., KUUSK V., BANDŽIULIENĖ R., 1993: *Pteridophyta*. – In: LAASIMER L., KUUSK V., TABAKA L., LEKAVIČIUS A. (eds), *Flora of the Baltic Countries*, 1: 130–153. – Tartu.
- FISCHER E., LOBIN W., 1995: *Lycopodiales*. – In: GAMS H. (Begr.), *Kleine Kryptogamenflora*, 4. Die Moos- und Farnpflanzen Europas: 328–331. – Stuttgart–Jena–New York.
- GAVRILOVA G., ŠULC V., 1999: Latvijas vasculāro augu flora: Taksonu saraksts. – Rīga.
- HOLUB J., 1975: *Diphasiastrum*, a new genus in *Lycopodiaceae*. – *Preslia*, 47: 97–110.
- IVANENKO J. A., CVELEV N. N., 2004: O rode *Diphasiastrum* (*Lycopodiaceae*) v vostočnoj Evrope. – *Botaničeskij Žurnal*, 89: 100–113.
- KUKKONEN I., 2000: *Lycopodiaceae*. – In: JONSELL B. (ed.), *Flora Nordica*, 1: 1–13. – Stockholm.
- MINKEVIČIUS A., 1959: Sporiniai induočiai – *Pteridophyta*. – In: NATKEVIČAITĖ-IVANAUSKIENĖ M. (ed.), *Lietuvos TSR flora*, 1: 18–81. – Vilnius.
- PACZYNA A., 1972: Polskie gatunki rodzaju *Diphasium* Presl i ich rozmieszczenie w kraju. – *Fragmenta Floristica et Geobotanica*, 18 (3–4): 309–341.
- RAUSCHERT S., 1967: Taxonomie und Chorologie der *Diphasium*-Arten Deutschlands (*Lycopodiaceae*). – *Hercynia*, 4(4): 439–487.
- ROTHMALER W. (Begr.), JÄGER E. J., WERNER K. (Hrsg.), 2005: Exkursions flora von Deutschland, 4. Gefäßpflanzen: Kritischer Band. – München.
- TUPČIAUSKAITĖ J., ŽEMGULYTĖ T., 2010: K. Regelio indėlis *Diphasiastrum* Holub genties taksonominei įvairovei Lietuvoje pažinti. – *Vytauto Didžiojo universiteto Botanikos sodo raštai*, 14: 184–190. – Kaunas.

PIRMINIAI DUOMENYS APIE *DIPHASIASTRUM × ZEILLERI* (ROUY) HOLUB PAPLITIMĄ LIETUVOJE IR ŠIOS RŪŠIES IDENTIFIKAVIMO PROBLEMAS

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Santrauka

Vilniaus universiteto herbariume (WI) atlikta *Diphasiastrum* genties pavyzdžių taksonominė revizija, siekiant nustatyti ar tarp jų nėra *D. × zeilleri* rūšies augalų. Patikrinus 100 atskirų šakelių, buvusių 41 herbariumo lape, nustatyta, kad *D. × zeilleri* rūšiai priklauso 33 šakelės (17 herbariumo lapų). Vilniaus universiteto ir Lenkijos (pagal PACZYNA, 1972) herbariumų duomenimis Lietuvoje iš viso žinomos 25 *D. × zeilleri* radavietės iš 11 administracinių rajonų. Tiek literatūros apžvalga, tiek mūsų tyrimas rodo, kad atpažįstant *Diphasiastrum* genties rūšis susiduriama su sunkumais dėl jų pavyzdžių morfologinio variavimosi. *D. × zeilleri* ir ypač

D. complanatum (46 šakelės, 19 herbariumo lapų) rūšims priskirti WI pavyzdžiai gana heterogeniški, o *D. tristachyum* pavyzdžiai (21 šakelė, 7 herbariumo lapai) varijuoja palyginti mažai. Tačiau dėl kolekcijoje rastų tipišku *D. × zeilleri* pavyzdžių atpažinimo tikslumo abejonių nėra. Straipsnyje pateikiama *D. complanatum*, *D. tristachyum* ir *D. × zeilleri* rūšių augalų identifikavimo lentelės, WI kolekcijoje rastų tipišku šių rūšių atstovų pažinimui svarbios šakojimosi tipų, ventralinės ir dorsalinės šakelės pusių nuotraukos, *D. × zeilleri* rūšiai priskirtų WI pavyzdžių sąrašas ir išsamus *D. × zeilleri* rūšies morfologijos aprašas.