Lewinskya, a new genus to accommodate the phaneroporous and monoicous taxa of Orthotrichum (Bryophyta, Orthotrichaceae)

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Abstract – Molecular analyses have consistently evidenced the phylogenetic heterogeneity of Orthotrichum Hedw., and suggested the need to segregate the species with superficial stomata in a separate genus. A recent proposal has been made to accommodate the monoicous species with such stomata in the genus Dorcadion Adans. ex Lindb., which is, however, an illegitimate name according to the current Code of nomenclature of algae, fungi and plants. Consequently a new name is required, and the generic name Lewinskya F.Lara, Garilleti & Goffinet is proposed. New combinations are made for all the species included in the new genus. Given the long history of the genus Orthotrichum and the similarities between this genus and Lewinskya, the morphological and geographic circumscriptions of both genera are provided to define them accurately. The taxa remaining in Orthotrichum s.str. are also listed.

Biogeography / Diversity / Musci / Nomenclature / Systematics

INTRODUCTION

Acrocarpic mosses growing on trees or rocks, with orthotropic stems, leaves with short isodiametric cells above, elongate basal cells, undifferentiated marginal cells, a mitrate calyptra and with sporangia, which upon dehiscence reveal a diplolepideous (though often variously reduced) peristome, are accommodated in the genus Orthotrichum Hedw. The genus is part of the tribe Orthotricheae Goffinet & Vitt, within the Orthotrichaceae Arnott, a highly speciose and cosmopolitan family. At the end of the last century, Goffinet & Vitt (1998) proposed a revised classification whereby the Orthotrichaceae included five genera (i.e., Muelleriella Dusén, Orthomitrium Lewinsky & Crosby, Orthotrichum, Stoneobryum Norris & H.Rob. and Ulota D.Mohr). Lewinsky-Haapasaari & Hedenäs (1998) subsequently

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segregated *O. paraguense* Besch. in the new genus *Sehnemobryum* Lewinsky & Hedenäs. Most species of the Orthotricheae belong to either *Orthotrichum* or *Ulota*, with the remaining genera holding only one to five species (Crosby *et al.*, 1999). Generic concepts within the tribe reflect patterns in the ornamentation of laminal cells, the precocious germination of spores (endospory), differentiation of the laminal margin, costal anatomy and architecture and distribution of the stomata (Goffinet & Vitt, 1998; Lewinsky-Haapasaaari & Hedenäs, 1998). However, both speciose genera harbor variation in these traits, most notably with *Orthotrichum* including species with either superficial (phaneroporous) or immersed (cryptoporous) stomata.

Lewinsky (1993a) critically revised the taxonomic diversity of *Orthotrichum*. The circumscription of the genus continues to grow, with 45 taxa added since 1993. The species have been historically organized into subgenera and sections (e.g., Vitt, 1971). Phylogenetic inferences from morphological traits providing the basis for these infrageneric taxa suggested, however, significant homoplasy in these traits (Lewinsky-Haapasaaari & Hedenäs, 1998). Furthermore, the phylogenetic significance of transformations in the generic traits appeared ambiguous, with Goffinet *et al.* (1998) providing the first evidence from analyzing *rbc*L sequences that *Orthotrichum* as circumscribed and diagnosed by Lewinsky (1993a) was an artificial lineage. Goffinet *et al.* (2004) subsequently corroborated this hypothesis based on inferences from four loci, demonstrating that a) species with superficial stomata shared a unique ancestor with *Ulota*, b) *Muelleriella* and *Orthomitrium* were nested among species with immersed stomata, c) *Orthotrichum exiguum* belonged to the tribe *Zygodonteae* (Schimp.) Goffinet, but that d) *Stonemobryum* and *Sehnemobryum* were indeed distinct. However, Goffinet *et al.* (2004) preferred to retain *Orthotrichum sensu* Lewinsky until the inferences could be strengthened by additional data from a more extensive sampling of taxa. Thus by 2004, the Orthotricheae included four genera: *Orthotrichum*, *Sehnemobryum*, *Stonemobryum* and *Ulota* (Goffinet & Buck, 2004).

The polyphyly of *Orthotrichum* was repeatedly suggested by inferences from molecular data (Goffinet *et al.*, 2007; Plášek *et al.*, 2009, 2011; Sawicki *et al.*, 2009, 2010, 2012; Vigalondo *et al.*, 2016a). Sawicki *et al.* (2010) proposed the first systematic consequences since 2004 to reflect the phylogenetic reconstruction, and reinstated *Nyholmiella* Holmen & E.Warncke for *O. gymnostomum* Bruch ex Brid. and *O. obtusifolium* Brid., traditionally composing subgenus *Orthophyllum* Delogne (Vitt, 1971). Plášek *et al.* (2015) further divided *Orthotrichum* and segregated *O. lyellii* Hook. & Taylor in the new genus *Pulvigera* Plášek, Sawicki & Ochyra, and resurrected *Dorcadion* Adans. *ex* Lindb. to accommodate the monoicous and phaneroporous taxa of *Orthotrichum*. The genus *Orthotrichum s.str.* would thus be restricted to the cryptoporous species. Although this revised classification of the Orthotricheae settles the incongruence between phylogenetic inferences and systematic concepts, assuming that a criterion of monophyly is considered necessary (see Zander, 2013), nevertheless it invokes an illegitimate name. Consequently we propose a new name, *Lewinskya gen. nov.* for *Dorcadion* Adans. *ex* Lindb. *sensu* Plášek *et al.* (2015). Furthermore we provide an expanded morphological description of the genus, an assessment of its geographic distribution and a complete taxonomic circumscription with all necessary new combinations. With the proposed segregation of a significant number of species from *Orthotrichum s.str.*, the morphological and geographic distribution of this genus needs to be revised, too. Hence we present along with the current circumscription of *Orthotrichum* a description of its morphological traits and distribution.
METHODS


RESULTS AND DISCUSSION

Nomenclature and taxonomy

Lindberg (1878) proposed to restore the pre-Hedwigian name Dorcadion (Adanson, 1763) for the genus Orthotrichum (Hedwig, 1801), thus creating a superfluous name. The author (Lindberg, 1878: 6) pointed this out neatly and indisputably, when he refers to the names of Adanson (1763): “All of the new ones are composed of rather heterogeneous links and therefore unnatural, with the exception of two, Sekra and Dorcadion, the former the same as Cinclidotus P.-B., the latter completely the same as Orthotrichum Hedw.” (“Af de nya äro alla sammansatta af ganska heterogena länkar och derför onaturliga, med undantag af två, Sekra och Dorcadion, det förra alldeles detsamma som Cinclidotus P.-B., det sednare fullkomligt liktydigt med Orthotrichum Hedw.”). A few pages later, Lindberg (1878: 35) created some confusion when he listed the genera that would constitute the Grimmiaceae, since using a broad concept he cited “Weissia (Ulota), Dorcadion (Orthotrichum Hedw. p. p.), ...”, which could suggest that Dorcadion is a new taxon incorporating only part of the members of Orthotrichum. However, what he did here was to indicate that under Dorcadion he included all the species of Orthotrichum as defined by Hedwig, except for those included in Weissia Ehrh. ex G. Gaertn., B.Mey. & Scherb. (Ulota D.Mohr). At that time, however, Orthotrichum already excluded the species of Ulota, given the combination U. crispa (Hedw.) Brid. established by Bridel (1818). Furthermore, Lindberg (1879), in his Musci Scandinavici, proposed two subgenera within Dorcadion, Calyptoporus and Gymnoporus (nomina nuda) that included the species with immersed and superficial stomata, respectively, that had until then been included in Orthotrichum (excluding Ulota). Therefore, we argue that Lindberg had the same concept for Dorcadion and Orthotrichum, once Ulota species were excluded. Consequently, Dorcadion is superfluous and thus illegitimate according to the Code of nomenclature of algae, fungi and plants.
(McNeill et al., 2012), as previously indicated by Wijk et al. (1964) and Lewinsky (1993a).

Since *Dorcadion* is an illegitimate name, it must be replaced. We propose the name *Lewinskya* F.Lara, Garilleti & Goffinet, in honour of the late Jette Lewinsky-Haapasaari, whose taxonomic work underlies much of our current knowledge and understanding of the diversity of the Orthotrichaceae. The establishment of a new genus requires the designation of a type, which ideally reflects the typical morphological features of the genus. With the proposed selection of *Orthotrichum striatum* Hedw., each of the three species originally included in *Orthotrichum* by
Hedwig (1801) are now the type species for the three speciose genera of the Orthotricheae: *Orthotrichum s.str.*, *Ulota*, and *Lewinskya*.

**Lewinskya F.Lara, Garilleti & Goffinet gen. nov.**

Type: *Lewinskya striata* (Hedw.) F.Lara, Garilleti & Goffinet, *comb. nov.* ≡ *Orthotrichum striatum* Hedw.


Diagnosis: Orthotricho similis, a quo plerumque differt foliorum basalibus cellulis elongatis, parietibus incrassatis nodulosisque, sexuali conditione gonioautoica,

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**Note:**

Total number of taxa recognized for the respective areas. The second numeral (in bold) refers to the number of taxa exclusive of each area, indicating between brackets the endemicity rate for each area.
capsulis saepe laevibus, stomatibus phaneroporis, endostoma sine membrana connectivali, sporisque diametro generatim 20 μm maiore.

Circumscription of *Lewinskya* and *Orthotrichum s.str.*

*Lewinskya*

Plants small or large, to 5 cm high, rarely smaller than 1 cm, in more or less loose cushions. Leaves erect or erect-patent when dry, sometimes flexuose,
rarely crisped, with plane or recurved margins, sometimes undulate, exceptionally incurved. Leaf apex acute to long acuminate, sometimes aristate, rarely obtuse, rounded or retuse. Leaf lamina unistratose, exceptionally predominantly bistratose in the upper half. Upper leaf cells isodiametric or oblong, sometimes elongate, variably papillose or smooth. Basal leaf cells mostly elongate, with incrassate walls, often dimorphic, with rows of cells with nodulose and coloured walls between cells with hyaline and more or less sinuose walls; alar cells occasionally differentiated. Propagules absent, except for one report of claviform propagules, with longitudinal and transverse walls, similar to those of *Zygodon*. Gonialautoicus. Calyptra more or less hairy, frequently densely so, exceptionally naked. Vaginula naked or hairy, recognized for the respective areas. The second numeral (in **bold**) refers to the number of taxa exclusive of each area, indicating between brackets the endemivity rate for each area.
commonly with some long and papillose hairs. Sporophytes usually 1 per perichaetium, occasionally in pairs in several species, consistently many in some species. Seta short, generally as long as capsule, or more or less longer, exceeding the perichaetal leaves. Capsule immersed, emergent or exserted, then often longly so. Urn frequently cylindrical, sometimes ovoid, rarely globose or cup-shaped, often smooth or with 8 ribs scarcely and variably developed, less frequently with prominent ribs. Exothecial bands not or scarcely differentiated in most species, well differentiated in others. Stomata superficial, generally in the middle of the urn, less frequently in its upper or lower portions. Peristome generally double, rarely simple, exceptionally vestigial. Prostome frequent, variably developed. Exostome of 8 pairs of fused teeth, less frequently of 16 free teeth, occasionally very reduced or almost absent. Endostome of 8 or 16 segments, rarely vestigial or absent, frequently very wide but sometimes more or less narrow, almost always internally biseriate, exceptionally uniseriate, almost always roughly ornamented, with irregular or regular margins, without connecting membrane. Spores frequently over 20 μm in diameter, usually unicellular, sometimes with a proportion two-celled, exceptionally multicellular.

The genus comprises 70 taxa (66 species and 4 varieties), which are mostly epiphytes, with some being saxicolous. The diversity of species is unevenly distributed (Fig. 1). The Northern Hemisphere harbors 46 taxa (66% of the total) and 38 of these (83%) are not known from the austral territories. Thirty-two taxa (46% of the total) occur in the Southern Hemisphere, and 24 of these (75%) are absent from septentrional territories. The percentage of endemics in each region (based on the divisions in Wijk et al., 1964) is notably higher in the Southern Hemisphere.

Orthotrichum s.str.

Type: Orthotrichum anomalum Hedw.

Plants small or medium sized, frequently less than 1 cm high, forming more or less compact cushions or, more rarely, patches. Leaves erect when dry, rarely contorted, with recurved margins, rarely plane. Leaf apex commonly acute or acuminate but frequently specialized: obtuse, rounded, denticulate, channeled, mucronate or piliferous. Leaf lamina generally unistratose, frequently with bistratose bands, in several species predominantly bistratose. Upper leaf cells isodiametric, rarely oblong, generally papillose, with simple or branched papillae, sometimes smooth or almost so. Basal leaf cells rectangular, with straight or somewhat sinuose walls, thin or slightly incrassate, only occasionally more or less nodulose, monomorphic; alar cells not differentiated. Propagules frequently present on leaves, more rarely also on rhizoids, cylindrical to vermiform, only with transverse walls, sometimes branched; exceptionally with rhizoidal tubers. Cladatoicous, always with a terminal perigonium in the male branches, frequently also with lateral perigonia. Calyptra variably hairy to naked. Vaginula naked or, less frequently, hairy. One sporophyte per perichaetium, polysety exceptional. Seta short, often extremely so, rarely longer than the perichaetal leaves. Capsule immersed to long-emergent, only occasionally exserted, rarely long-exserted. Urn cylindrical to urceolate, often shortly so, with 8 ribs, rarely 16, more or less prominent and wide, occasionally limited to the distal area, never totally smooth. Exothecial bands generally well differentiated. Stomata immersed, more or less covered by the subsidiary cells, exceptionally almost uncovered and apparently superficial, often limited to the urn base, occasionally spreading across the neck. Peristome generally double, rarely
simple or absent. Prostome occasional, variably developed. Exostome of 8 pairs of teeth, rarely 16 completely independent, occasionally vestigial or absent. Endostome of 8 or 16 segments, rarely completely absent, generally filiform, rarely wide, exceptionally fused, smooth or ornamented, with differentiated connecting membrane, sometimes incomplete. Spores usually unicellular, in most cases with diameters of less than 20 μm, pluricellular in some species.

The genus comprises 103 taxa (94 species, 1 subspecies and 8 varieties) that are mostly epiphytes, although some species are exclusively or preferentially saxicolous. The distribution of species diversity and endemics is also very uneven (Fig. 2). The Northern Hemisphere hosts 83 taxa (81% of the total), with 76 of these (92%) being exclusive. In the Southern Hemisphere 27 taxa are known (26% of the total), and 20 of these (74%) do not reach any of the septentrional territories. Endemism is high across the Southern Hemisphere, but also in the Northern Hemisphere, and particularly in North America (Am 1) and Eastern Asia (the China-Japan area, AS 2; Fig. 2). The Mediterranean basin is a center of diversity (Lara et al., 2009b) not evidenced in the chosen geographic divisions.

KEY TO GENERA

Stomata superficial. Basal leaf cells mostly elongate, with incrasate and sinuose or nodulose walls. Goniautoicous. Endostome without connecting membrane. Gametophores usually taller than 1 cm. Capsules often smooth or faintly ribbed when dry, frequently exserted. Propagules absent. Spores frequently over 20 μm in diameter ...........................................................................................................Lewinskya

Stomata immersed, more or less covered by the subsidiary cells. Basal leaf cells rectangular, usually with thin, not nodulose walls. Cladautoicous. Endostome with connecting membrane, sometimes incomplete. Gametophores usually smaller than 1 cm. Capsules mostly strongly ribbed when dry, rarely exserted. Propagules frequently present. Spores usually less than 20 μm in diameter........

................................................................................................................................Orthotrichum

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APPENDIX 1

Taxa included in the genus *Lewinskya* F.Lara, Garilleti & Goffinet, with indication of their known distribution as shown in Fig. 1.

**Lewinskya acuminata** (H.Philib.) F.Lara, Garilleti & Goffinet, **comb. nov.**
Distribution: Am 1, Eur, AFR 1, AFR 2, AFR 5, AS 5.

**Lewinskya affinis** (Schrad. ex Brid.) F.Lara, Garilleti & Goffinet, **comb. nov.**
≡ *Orthotrichum affine* Schrad. ex Brid., Muscol. Recent. 2: 22-23. 1801
Distribution: Am 1, Eur, AFR 1, AFR 5, AS 1, AS 5.

**Lewinskya anaglyptodon** (Cardot & Broth.) F.Lara, Garilleti & Goffinet, **comb. nov.**
≡ *Orthotrichum anaglyptodon* Cardot & Broth., Kongl. Svenska Vetensk. Acad. Handl. n.s. 63: 31, 2 f. 10. 1923
Distribution: Am 6.

**Lewinskya araucarieti** (Müll.Hal. in Brotherus) F.Lara, Garilleti & Goffinet, **comb. nov.**
Distribution: Am 5, Am 6.

**Lewinskya arborescens** (Thér. & Naveau) F.Lara, Garilleti & Goffinet, **comb. nov.**
Distribution: AFR 2.

**Lewinskya armata** (Lewinsky & van Rooy) F.Lara, Garilleti & Goffinet, **comb. nov.**
≡ *Orthotrichum armatum* Lewinsky & van Rooy, J. Bryol. 16: 69, f. 2–5. 1990
Distribution: AFR 4.

**Lewinskya bolanderi** (Sull.) F.Lara, Garilleti & Goffinet, **comb. nov.**
≡ *Orthotrichum bolanderi* Sull., Icon. Musc. Suppl. 64, pl. 46. 1874
Distribution: Am 1, Am 2.

**Lewinskya brassii** (E.B.Bartram) F.Lara, Garilleti & Goffinet, **comb. nov.**
≡ *Orthotrichum brassii* E.B.Bartram, Lloydia 5: 268, 25. 1942
Distribution: AS 4.

**Lewinskya breviseta** (F.Lara, Garilleti & Mazimpaka) F.Lara, Garilleti & Goffinet, **comb. et stat. nov.**
≡ *Orthotrichum speciosum* var. *brevisetum* F.Lara, Garilleti & Mazimpaka, J. Bryol. 25: 276, f. 2. 2003
Distribution: Eur, AFR 1, AS 5.
Within the context of the new genus, *L. breviseta* differs from *Lewinskya speciosa* in significative morphological characters, such as the short seta and the ribbed capsules. Additionally, both mosses show very different ecological preferences and distribution ranges, being *L. breviseta* restricted to Mediterranean environments whereas *L. speciosa* is a Boreal widespread species that seems to avoid climates with strong summer drought (Ellis *et al*., 2015b). All these divergences lead us to propose the recognition of *L. breviseta* at the species level.

**Lewinskya brotheri** (Dusén ex Lewinsky) F.Lara, Garilleti & Goffinet, **comb. nov.**
Distribution: Am 6.

**Lewinskya cyathiformis** (R.Br.bis) F.Lara, Garilleti & Goffinet,
Lewinskya gen. nov. 375

comb. nov.
≡Orthotrichum cyathiforme
Distribution: AUSTR 2.

Lewinskya dasymitria (Lewinsky in T.Koponen & J.X.Luo) F.Lara, Garilleti & Goffinet, comb. nov.
≡Orthotrichum dasymitrium
Distribution: AS 2, AS 3.

Lewinskya densa (Lewinsky) F.Lara, Garilleti & Goffinet, comb. nov.
Distribution: Am 6.

Lewinskya elegans (Schwägr. ex Hook. & Grev.) F.Lara, Garilleti & Goffinet, comb. nov.
≡Orthotrichum elegans Schwägr. ex Hook. & Grev., Edinburgh J. Sci. 1: 122, pl. 6 [upper right]. 1824
Distribution: Am 1.

Lewinskya elegantula (Schimp. ex Mitt.) F.Lara, Garilleti & Goffinet, comb. nov.
Distribution: Am 6.

Lewinskya elongata (Taylor) F.Lara, Garilleti & Goffinet, comb. nov.
≡Orthotrichum elongatum Taylor, London J. Bot. 5: 45. 1846

Lewinskya erosa (Lewinsky) F.Lara, Garilleti & Goffinet, comb. nov.
Distribution: AS 2.

Lewinskya fenestrata (Cardot & Thér.) F.Lara, Garilleti & Goffinet, comb. nov.
≡Orthotrichum fenestratum Cardot & Thér., Proc. Wash. Acad. Sci. 4: 310-311, pl. 16, f. 2. 1902
Distribution: Am 1.

Lewinskya firma (Venturi) F.Lara, Garilleti & Goffinet, comb. nov.
Distribution: AFR 2, AFR 4, AS 3.

Lewinskya galiciae (F.Lara, Garilleti & Mazimpaka) F.Lara, Garilleti & Goffinet, comb. nov.
≡Orthotrichum galiciae F.Lara, Garilleti & Mazimpaka, Nova Hedwigia 83: 200. 2006
Distribution: AFR 2.

Lewinskya graphiomitria (Müll.Hal. ex Beckett) F.Lara, Garilleti & Goffinet, comb. nov.
Distribution: AUSTR 2.

Lewinskya hawaiica (Müll.Hal.) F.Lara, Garilleti & Goffinet, comb. nov.
Distribution: OC.

Lewinskya holzingeri (Renauld & Cardot in Holzinger) F.Lara, Garilleti & Goffinet, comb. nov.
≡Orthotrichum holzingeri Renauld & Cardot in Holzinger, Contr. U.S. Natl. Herb. 3: 270. 1895
Distribution: Am 1.

Lewinskya hookeri (Wilson ex Mitt.) F.Lara, Garilleti & Goffinet, comb. nov.
Distribution: AS 2, AS 3.

Lewinskya hookeri var. granulata (Lewinsky) F.Lara, Garilleti & Goffinet, comb. nov.
≡Orthotrichum hookeri var. granulatum Lewinsky, J. Hattori Bot. Lab. 72: 20. 1992
Distribution: AS 2, AS 3.
**Lewinskya hortensis** (Bosw.) F.Lara, Garilleti & Goffinet, **comb. nov.**
≡ *Orthotrichum hortense* Bosw.,
J. Bot. 30: 97. 1892
Distribution: Am 6, AUSTR 1, AUSTR 2.

**Lewinskya hortoniae** (Vitt) F.Lara, Garilleti & Goffinet, **comb. nov.**
≡ *Orthotrichum hortense* Vitt,
Bryologist 82: 2, f. 1-9, 62, 64. 1979
Distribution: Am 2.

**Lewinskya iberica** (F.Lara & Mazimpaka) F.Lara, Garilleti & Goffinet, **comb. nov.**
Distribution: Eur, AFR 1, AS 5.

**Lewinskya incrassata** (Lewinsky) F.Lara, Garilleti & Goffinet, **comb. nov.**
≡ *Orthotrichum incrassatum* Lewinsky, Bryobrothera 2: 67, f. 4-5. 1993
Distribution: OC.

**Lewinskya incovomarginata** (Lewinsky & van Rooy) F.Lara, Garilleti & Goffinet, **comb. nov.**
≡ *Orthotrichum incovomarginatum* Lewinsky & van Rooy, J. Bryol. 16: 67, f. 1, 4. 1990
Distribution: AFR 4.

**Lewinskya iwatsukii** (Ignatov) F.Lara, Garilleti & Goffinet, **comb. nov.**
≡ *Orthotrichum iwatsukii* Ignatov,
Aretoa 10: 172. 2001
Distribution: Eur, AS 1, AS 2, AS 3.

**Lewinskya johnstonii** (E.B.Bartram) F.Lara, Garilleti & Goffinet, **comb. nov.**
≡ *Orthotrichum johnstonii*
E.B.Bartram, Trav. Bryol. 1: 132. 1942
Distribution: Am 6.

**Lewinskya keeverae** (H.A.Crum & L.E.Anderson) F.Lara, Garilleti & Goffinet, **comb. nov.**
Distribution: Am 1.

**Lewinskya laevigata** (J.E.Zetterst.) F.Lara, Garilleti & Goffinet, **comb. nov.**
Distribution: Am 1, Eur, AS 1.

**Lewinskya latimarginata** (Lewinsky) F.Lara, Garilleti & Goffinet, **comb. nov.**

**Lewinskya laxifolia** (Wilson ex Mitt.) F.Lara, Garilleti & Goffinet, **comb. nov.**

**Lewinskya leiolecythis** (Müll.Hal.) F.Lara, Garilleti & Goffinet, **comb. nov.**
Distribution: AS 2.

**Lewinskya ludificans** (Lewinsky) F.Lara, Garilleti & Goffinet, **comb. nov.**
Distribution: Am 6.

**Lewinskya mandonii** (Schimp. ex Hampe) F.Lara, Garilleti & Goffinet, **comb. nov.**

**Lewinskya pariata** (Mitt.) F.Lara, Garilleti & Goffinet, **comb. nov.**
≡ *Orthotrichum pariatum* Mitt.,
Lewinskya gen. nov. 377

J. Linn. Soc. Bot. 12: 186. 1869

Lewinskya praemorsa (Venturi) F.Lara, Garilleti & Goffinet, **comb. nov.**
≡Orthotrichum praemorsum Venturi, Bot. Centralbl. 44: 418. 1890
Distribution: Am 1.

Lewinskya psychrophila (Mont.) F.Lara, Garilleti & Goffinet, **comb. nov.**
Distribution: Am 6.

Lewinskya pulchra (Lewinsky) F.Lara, Garilleti & Goffinet, **comb. nov.**
Distribution: Am 1, Am 2, Am 4, Am 6.

Lewinskya pycnophylla var. verrucosa (Müll.Hal.) F.Lara, Garilleti & Goffinet, **comb. nov.**
Hal., Linnaea 42: 359. 1879

Lewinskya pylayisia (Brid.) F.Lara, Garilleti & Goffinet, **comb. nov.**
Bryol. Univ. 1(1): 722. 1826
Distribution: Am 1, Eur, AS 1.

Lewinskya rupestris (Schleich. ex Schwägr.) F.Lara, Garilleti & Goffinet, **comb. nov.**
Distribution: Am 1, Am 2, Am 4, Am 5, Am 6, Eur, AFR 1, AFR 2, AFR 4, AFR 5, AS 1, AS 2, AS 3, AS 5, AUSTR 1, AUSTR 2, OC, ANT.

Lewinskya rupestris var. papillosa (Lewinsky) F.Lara, Garilleti & Goffinet, **comb. nov.**
≡Orthotrichum rupestrum var. papillosum Lewinsky, J. Hattori Bot. Lab. 56: 402. 1984
Distribution: Am 6, AUSTR 2.

Lewinskya sainsburyi (Allison) F.Lara, Garilleti & Goffinet, **comb. nov.**
Distribution: AUSTR 2.

Lewinskya schoddei (Lewinsky) F.Lara, Garilleti & Goffinet, **comb. nov.**
≡Orthotrichum schoddei Lewinsky, J. Hattori Bot. Lab. 72: 34, f. 1-10. 1992
Distribution: Am 1, Eur, AFR 1, AS 5.

Lewinskya sordida (Sull. & Lesq. in Austin) F.Lara, Garilleti & Goffinet, **comb. nov.**
≡Orthotrichum sordidum Sull. & Lesq. in Austin, Musci Appalachian 30. 1870
Distribution: Am 1, Eur, AS 1, AS 2, AS 5.

Lewinskya spanotricha (Lewinsky) F.Lara, Garilleti & Goffinet, **comb. nov.**

Lewinskya speciosa (Nees) F.Lara, Garilleti & Goffinet, **comb. nov.**
≡Orthotrichum speciosum Nees, Deutschl. Fl. Abt. II Cryptog. 5: 5. 1819
Distribution: Am 1, Eur, AFR 1, AS 1, AS 2, AS 5.
Lewinskya spjutii (D.H. Norris & Vitt) F. Lara, Garilleti & Goffinet, **comb. nov.**
Distribution: Am 1.

Lewinskya steerei (Lewinsky) F. Lara, Garilleti & Goffinet, **comb. nov.**

Lewinskya striata (Hedw.) F. Lara, Garilleti & Goffinet, **comb. nov.**
≡ Orthotrichum striatum Hedw., Sp. Musc. Frond. 163. 1801
Distribution: Am 1, Eur, AFR 1, AFR 5, AS 1, AS 2, AS 3, AS 5.

Lewinskya subulata (Mitt.) F. Lara, Garilleti & Goffinet, **comb. nov.**

Lewinskya taiwanensis (Lewinsky) F. Lara, Garilleti & Goffinet, **comb. nov.**
Distribution: AS 2.

Lewinskya tanganyikae (P. de la Varde) F. Lara, Garilleti & Goffinet, **comb. nov.**
Distribution: AFR 2, AFR 4.

Lewinskya tasmanica (Hook. f. & Wilson) F. Lara, Garilleti & Goffinet, **comb. nov.**
≡ Orthotrichum tasmanicum Hook. f. & Wilson, London J. Bot. 7: 27, pl. 1 c. 1848
Distribution: AUS 1, AUS 2.

Lewinskya tasmanica var. parvitheca (R. Br. bis) F. Lara, Garilleti & Goffinet, **comb. nov.**
≡ Orthotrichum parvithecum R. Br. bis, Trans. & Proc. New Zealand Inst. 27: 440, pl. 41 f. 1894[1895]
Distribution: AUS 2.

Lewinskya tenuicaulis (Lewinsky) F. Lara, Garilleti & Goffinet, **comb. nov.**
≡ Orthotrichum tenuicaule Lewinsky, J. Hattori Bot. Lab. 75: 45, f. 1. 1994

Lewinskya tortidontia (F. Lara, Garilleti & Mazimpaka) F. Lara, Garilleti & Goffinet, **comb. nov.**
Distribution: Eur, AFR 1, AS 5.

Lewinskya tortifolia (Lewinsky) F. Lara, Garilleti & Goffinet, **comb. nov.**
≡ Orthotrichum tortifolium Lewinsky, J. Hattori Bot. Lab. 72: 23, f. 11. 1992
Distribution: AS 3.

Lewinskya truncatodentata (Müll. Hal.) F. Lara, Garilleti & Goffinet, **comb. nov.**
≡ Orthotrichum truncatodentatum Müll. Hal., Linnaea 43: 442. 1882
Distribution: Am 6.

Lewinskya truncata (Lewinsky & Deguchi) F. Lara, Garilleti & Goffinet, **comb. nov.**
Distribution: Am 6.

Lewinskya vicaria (Laz.) F. Lara, Garilleti & Goffinet, **comb. nov.**
Distribution: AS 1.

Lewinskya vladikavkana (Venturi in Husnot) F. Lara, Garilleti & Goffinet, **comb. nov.**
≡ Orthotrichum vladikavkanum Venturi in Husnot, Muscol. Gall. 167. 1887
Distribution: Eur, AS 1, AS 5.
APPENDIX 2

Taxa included in the genus *Orthotrichum* Hedw., with indication of their known distribution as shown in Fig. 2.


*Orthotrichum bartramii* R.S.Williams, Bryologist 28: 76, pl. 9. 1925. Distribution: Am 1, Am 2.


Orthotrichum lescurii Austin, Musci Appalach. 163. 1870. Distribution: Am 1.


Orthotrichum philibertii Venturi, Rev. Bryol. 5: 45. 1878. Distribution: Eur, AFR 1, AS 5.


