

NOTES ON PHILONOTIS (BARTRAMIACEAE, MUSCI). 1. STATUS AND DISTRIBUTION OF PHILONOTIS FALCATA (HOOK.) MITT.

ЗАМЕТКИ О PHILONOTIS (BARTRAMIACEAE, MUSCI). 1. СТАТУС И РАСПРОСТРАНЕНИЕ PHILONOTIS FALCATA (HOOK.) MITT.

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Abstract

Philonotis falcata (Hook.) Mitt. is exclusively an Asiatic taxon; records from North America and Europe are based on misunderstandings. It was reported from Europe in the 1820's, but later European bryologists excluded it from the European flora. The epithet *falcata* was connected with *Philonotis fontana* (Hedw.) Brid. at the varietal level, as *P. fontana* var. *falcata* (Mitt.) Brid., and later synonymized with both *P. calcarea* (Bruch & Schimp.) Schimp. and *P. fontana* var. *fontana*. *Philonotis falcata* differs from them in many characters, such as the shape of the leaves, leaf-cell areolation, distribution of papillae and mamillae on leaf cells, and seriate leaves, and it has been placed in a different subsection. *Philonotis falcata* is for the first time recorded for Kirgizia, and the former Soviet Union.

Резюме

Philonotis falcata (Hook.) Mitt. является чисто азиатским видом. Указания на его находки в Северной Америке и Европе были основаны на его неверном понимании. Его указывали в Европе в 1820-х гг., но впоследствии он был исключен из флоры Европы. Эпитет *falcata* имел отношение и к *Philonotis fontana* (Hedw.) Brid., где фигурировал в названии разновидности, *P. fontana* var. *falcata* (Mitt.) Brid., которую относили в синонимы или к *P. calcarea* (Bruch & Schimp.) Schimp., или к *P. fontana* var. *fontana*. *Philonotis falcata* отличается от этих видов по многим признакам, в частности по форме листьев, строению клеточной сети, расположению папилл и мамилл на клетках листьев, расположению листьев в правильных рядах, в связи с чем справедливо его отнесение к другой подсекции. *Philonotis falcata* впервые отмечается для Киргизии и территории бывшего Советского Союза.

INTRODUCTION

For several reasons it is necessary to discuss the status of *Philonotis falcata* (Hook.) Mitt.: (1) records persistently appear claiming its presence in Europe; (2) the taxon was recently synonymized with *P. calcarea* (Bruch & Schimp.) Schimp., which is an error, and (3) *P. falcata* specimens collected in Kirgizia by V. F. Brothrus in 1896 were located; these should have been the first collections known from the area of the former Soviet Union, but the synonymizing mentioned above postulated a wide range for *P. falcata* in European and Siberian Russia and in Middle Asia, including Kirgizia. However, several workers have clearly shown that *P. falcata* is solely an East and Southeast Asiatic taxon.

***Philonotis falcata* (W. J. Hook.) Mitt.** (Figs. 1-2)

J. Linn. Soc. Bot. Suppl. 1: 62. 1859. - *Bartramia falcata* W. J. Hooker, Trans. Linn. Soc. London 9: 317. 27 f. 4. 1808. - *P. fontana* var. *falcata* (W. J. Hook.) Brid., Bryol. Univ. 2: 21. 1827. - Type: Nepal, leg. F. Buchanan (BM!).

Hooker (1808) described *Bartramia falcata* based on a Himalayan specimen. The description and the figures of the protologue are so clear that a misunderstanding is not possible. Bridel-Brideri (1827) combined the epithet to the varietal level, as *Philonotis fontana* var. *falcata* and gave its distribution: "In tota Europa vulgaris, uda tenens". This obviously caused long-lasting confusion. Still "Index muscorum" (Wijk et al. 1967) gave its distri-

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bution as Europe, North America, Southeast Asia and Oceania. However, several authors (see below) have already shown that *P. falcata* does not belong to the European and North American floras, and the modern checklists (Corley et al. 1981, Anderson et al. 1990) and floras from these areas have excluded the taxon.

Düll (1985) proposed that *P. fontana* var. *falcata* (Hook.) Brid. is a synonym of *P. calcarea* (Bruch & Schimp.) Schimp., and Anderson et al. (1990) synonymized it with *P. fontana* var. *fontana*, giving no reason, however, for the synonymizations. Warnstorf (1906) discussed the similarity and difficulties in separating falcate-leaved forms of *P. fontana* from sterile *P. calcarea*: “Var. *falcata* Schpr., Synops. ed. II, p. 520 (1876) [= Schimper 1876] ist eine kräftige, an *Ph. calcarea* erinnernde Form ..” “Eine ähnliche Form, wie sie in Kryptogamenfl. v. Deutschl. IV. Bd. 2. Abt. p. 569 [= Limpricht 1895] als var. *falcata* Brid. beschrieben wird.... und es dürfte vergebliche Mühe sein, dieselbe von steriler *Ph. calcarea* unterscheiden zu wollen.”

Loeske (1906) supported Warnstorf's view: “Warnstorf hat in seinem neuen Mooswerke zum ersten Male eine var. *falcata* so beschrieben, dass sie nur als form der *Ph. fontana* gedeutet werden kann. Diese Form muss *Ph. fontana* var. *falcata* Br. eur. ex p. Warnst. oder einfach var. *falcata* Warnstorf heißen”. By this statement Loeske (1906) actually created a later homonym *P. fontana* var. *falcata* Warnst. ex Loeske., which may have increased the confusion. Warnstorf's (1906) treatment was accepted by Dismier (1908); he cited falcate-leaved forms of *P. fontana* “var. *falcata* (Br. eur. et Syn. musc., ex p.) Warnst., Krypt., II, p. 611, 1905”. It is obvious that these European authors, M. G. Dismier, K. G. Limpricht, L. Loeske, W. P. Schimper, and C. Warnstorf, excluded the Asiatic type of *P. fontana* var. *falcata* (Hook.) Brid. from their concept of *P. fontana* var. *falcata*, and Kabiersch (1937) followed them.

Dismier (1910) later studied American *Philonotis* and did not even mention *P. falcata* in his paper. Moreover, he (Dismier 1912) made a study on *P. falcata* and its related taxa in which he synonymized many names and gave the distribution in detail. The western-most specimen seen by him came from Afghanistan, wherefrom the taxon extends its range through

the Himalayas, China and the Philippines to Japan. Kabiersch (1937) monographed East Asiatic *Philonotis* and reached the same conclusion, as did Ochi (1962, 1963). Accordingly, it is rather well established in the literature that *P. falcata* (Hook.) Mitt. (*P. fontana* var. *falcata* (Hook.) Brid.) occurs only in East and Southeast Asia, reaching Hawaii (Bartram 1933). Ignatov & Afonina (1992) followed Düll's (1985) synonymization of *P. falcata* with *P. calcarea*, and since they accepted the latter taxon at the varietal level, their *P. fontana* var. *falcata* (Hook.) Brid. gained a wide distribution in arctic and western Europe, Caucasus, Siberia, and Central Asia.

TAXONOMY

Ochi (1962) explained very clearly why *Philonotis falcata* can never be confused with *P. fontana* and its relatives; they have different types of distribution of leaf cell mammillae and papillae. The papillae in *P. falcata* are exclusively situated at the distal end of the leaf cell, but in *P. fontana* the mamillae or papillae are at the proximal end of the leaf cells, or rarely in the middle of the cells if the cells are very short. Other characters separating *P. falcata* and *P. fontana* are the leaf shape, and the size of cells in different parts of leaves. *P. falcata* has very distinctly carinate leaves with costa strongly bending, and the leaves are broadest at the insertion and gradually tapering to an acute or acuminate apex. The leaf cells are long and narrow down near the base, where several rows of cells a little wider and shorter are present; short acute leaves may, however, have short and wide cells throughout the leaf. Such plants Ochi (1962, 1963) included in the variety *carinata* (Mitt.) Ochi. *P. fontana* has a wide ovate leaf base from which the apical part is rather abruptly narrowed to an acute or acuminate apex. *P. fontana* has a distinct area of wide cells in the lower part of the leaf, and the cells in the narrowed apical part are much narrower than these lower cells.

One characteristic usually present in *Philonotis falcata* and absent from *P. fontana* is the seriate position of the leaves. In *P. falcata* the leaves are in distinct rows, best seen on leaves on innovations, while *P. fontana* has no rows. Kabiersch (1937) emphasized this difference between *P. falcata* and *P. fontana* by placing them in different subsections, *Falcatae* Kab. and

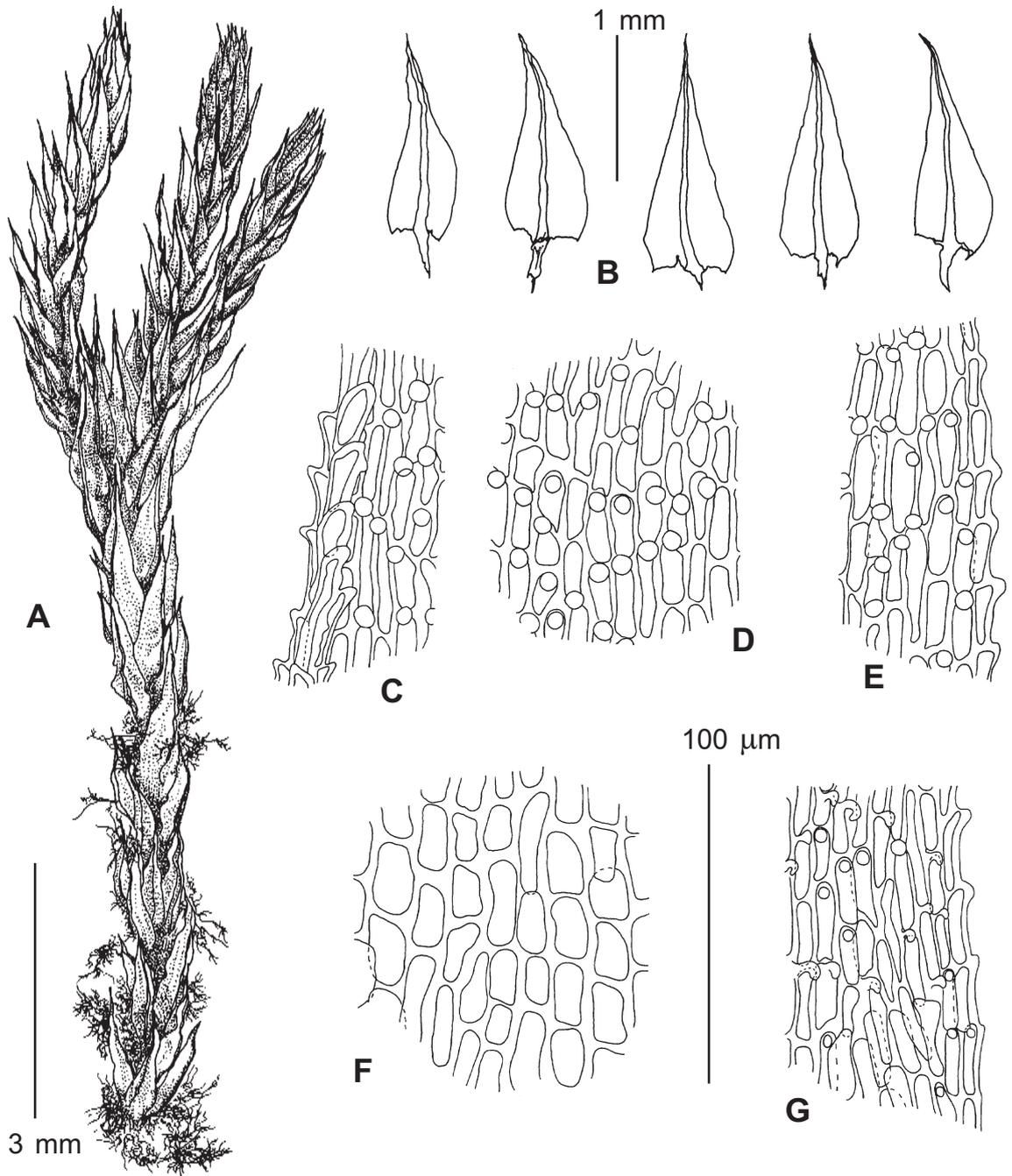


Fig. 1. *Philonotis falcata* (Hook.) Mitt. (from Brotherus reliquiae 10231, H): a – plant; b – leaves; c – leaf border near apex; d – leaf cells at mid-leaf; e – leaf border at midleaf; f – basal leaf cells; g – angular leaf cells. Scale bars: 3 mm – for a; 1 mm – for b; 100 μ m – for c-g.

Fontanae Kab. (nom. illeg., = subsection *Philonotis*). The characteristics of subsection *Falcatae* are leaves mostly in rows (in *P. seriata* Mitt., *P. falcata* and in *P. turneriana* (Schwaegr.) Mitt. in Kabiersch's sense) and the papillae of

the leaves not being basal on cells (except in *P. seriata*). I think that the subsection *Falcatae*, if limited as Kabiersch (1937) proposed, is not natural. On the basis of their leaf cell morphology and the distribution of their papillae,

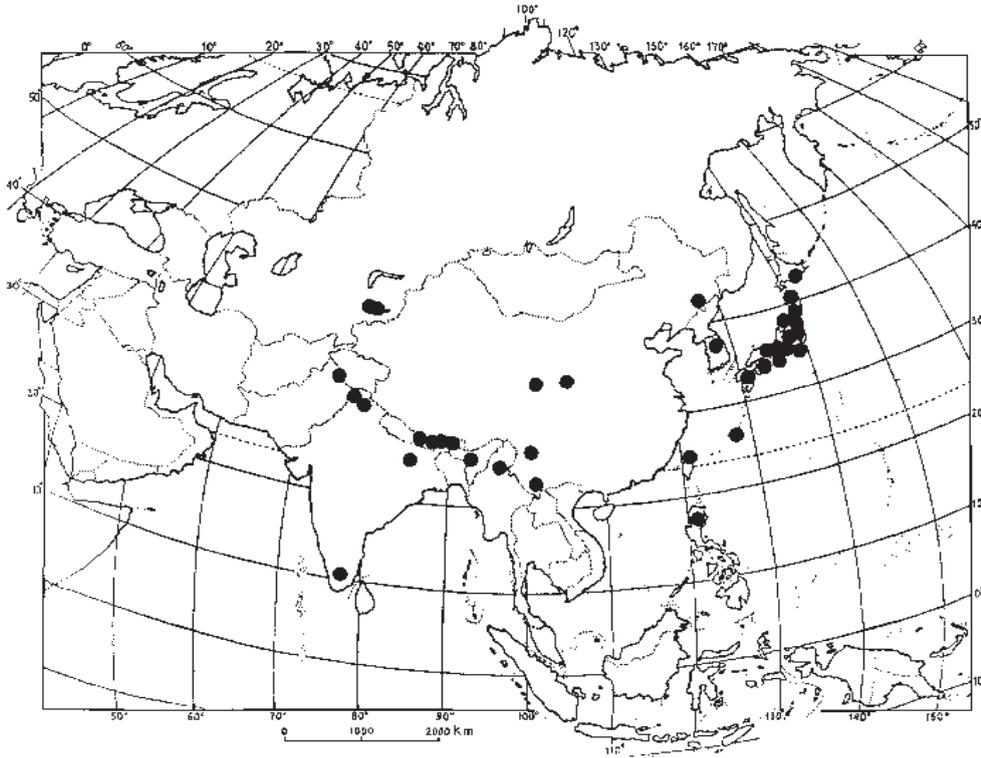


Fig. 2. Distribution of *Philonotis falcata* (Hook.) Mitt. Specimens in H and H-BR.

P. seriata and *P. yezoana* Card. & Besch. ex Card. are more closely related to *P. fontana* than to *P. falcata*. *Philonotis calcarea*, with which *P. falcata* was synonymized by Düll (1985) and Ignatov & Afonina (1992), is closely related to *P. fontana*. Kabiersch (1937) discussed *P. calcarea* under the subsection *Fontanae*.

The site and shape of the papillae seems to be not only a useful specific character for *Philonotis* (see Koponen 1996), but it may be possible to create a natural sectional division of *Philonotis* based on these and on the characters of the sporophytes (Koponen, in prep.).

DISTRIBUTION

In connection with ongoing studies to revise Southeast Asiatic *Philonotis* (Koponen 1993, 1995, 1996, Koponen & Norris 1996), I have until now studied all the specimens in H and H-BR and some materials from NY, FH and types from some other herbaria, altogether more than 1 000 specimens. My studies confirm the results presented by Dismier (1912), Kabiersch (1937), and Ochi (1962, 1963) that *P. falcata* ranges from the Himalayas through India, China, and Philippines to Japan. The Hawaiian plants included

in it may represent another taxon with a wide distribution in the Pacific and Melanesia.

Figure 2 is a preliminary map of the distribution of *Philonotis falcata*. Worth reporting are the first collections of *P. falcata* from the area of the former Soviet Union, specimens that were in the unidentified *Philonotis* collection in the bryophyte herbarium of the Botanical Museum of Helsinki University. The specimens were collected by V. F. Brotherus during his 1896 excursion to Middle Asia (Järvinen & Koponen 1975, Koponen 1989). Brotherus never identified the specimens; they came from his unidentified relique. This range extension may be remarkable; a rather larger number of East Asiatic bryophyte taxa extend their range to south Siberian areas (Ignatov 1992) and *P. falcata* is an additional taxon for this group.

CONCLUSION

(1) *Philonotis falcata* is a Southeast Asiatic taxon which does not occur in North America, Europe, or in most parts of Siberia. (2) It is not conspecific with *P. calcarea*, and (3) *P. falcata* is newly recorded for Kirgizia and the former Soviet Union.

Selected specimens studied: Kirgizia. Semirjetchensk, Tokmak, V. 1896 V. *F. Brotherus reliquia* 10231 (H); Kutemaldy, ad lacum Issikkul, 8.VI.1896 V. *F. Brotherus reliquia* 4457 (H).

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LITERATURE CITED

- ANDERSON, L. E., CRUM, H. A. & BUCK, W. R. 1990. List of the mosses of North America North of Mexico. – *Bryologist* **93**: 448-499.
- BARTRAM, E. B. 1933. Manual of Hawaiian mosses. – *Bishop Mus. Bull.* **101**: 1-275.
- BRIDEL-BRIDERI, S. E. 1827. Bryologia Universa seu systematica ad novam methodum dispositio, historia et descriptio omnium muscorum frondosorum hucusque cognitorum cum synonymia ex auctoribus probatissimis. Vol. **2**. 848 + 2 pp, 10 + 3 pls.
- CORLEY, M. F. V., CRUNDWELL, A. C., DÜLL, R., HILL, M. O. & SMITH, A. J. E. 1981. Mosses of Europe and the Azores; an annotated list of species, with synonyms from recent literature. – *J. Bryol.* **11**: 609-689.
- DISMIER, M. G. 1908. Essai monographique sur les Philonotis de France. – *Mem. Soc. Nation. Sci. Nat. Math. Cherbourg* **36**: 367-428.
- DISMIER, M. G. 1910. Revision des Philonotis de l'Amérique. – *Memoires Soc. Bot. France* **17**: 1-37.
- DISMIER, M. G. 1912. *Philonotis falcata* (Hook.) Brid., *Philonotis Turneriana* (Schw.) Mitt. et espèces affines considérées comme synonymes. – *Bull. Soc. Bot. France* **12**: 482-559.
- DÜLL, R. 1985. Distribution of the European and Macaronesian mosses (Bryophytina). Part 2. – *Bryol. Beitr.* **5**: 110-232.
- HOOKER, W. J. 1808. Musci Nepalenses; or descriptions of several new mosses from Nepal. – *Trans. Linnean Soc. London* **9**: 307-322, tab. 26-28.
- IGNATOV, M. I. 1992. Relationships of moss flora of the Altai Mts. – *Bryobrothera* **1**: 63-72.
- IGNATOV, M. I. & O. M. AFONINA 1992. Check-list of mosses of the former USSR. – *Arctoa* **1**: 1-85.
- JÄRVINEN, I. & T. KOPONEN 1975. The excursions of V. F. Brotherus in Central Asia in 1896 and his exsiccata "Musci turkestanici". – *Pamphlet Bot. Mus. Univ. Helsinki* **6**: 1-29.
- KABIERSCH, W. 1937. Studien über die ostasiatischen Arten einiger Laubmoosfamilien. II. – *Hedwigia* **77**: 74-136.
- KOPONEN, T. 1989. Viktor Ferdinand Brotherus, nuorempi lehtori. – In: Löytönen, M. (edit.), *Matka-Arkkua. Suomalaisia tutkimusmatkailijoita: 78-103*.
- KOPONEN, T. 1993. Genus *Philonotis* (Musci, Bartramiaceae) in the Pacific. – *XV International Botanical Congress. Abstracts*: 222.
- KOPONEN, T. 1995. *Philonotis* (Bartramiaceae, Musci) in southeast Asia, Australasia and the Pacific. Extract from a revision in progress. – In: Delgadillo M., C. (ed.), *International Bryological Conference Tropical Bryophytes: Biology, diversity and conservation. August 7-12. 1995, Mexico City. Scientific Program, Abstracts. Field Trips, Tourist Tips*: 32.
- KOPONEN, T. 1996. Characters useful in the taxonomy of *Philonotis* (Bartramiaceae). – *Univ. Trondheim Viten-skapsmus. Rapport Bot. Ser. (in press)*.
- KOPONEN, T. & D. H. NORRIS 1996. Bryophyte flora of the Huon Peninsula, Papua New Guinea. LVII. *Philonotis* (Bartramiaceae, Bryopsida). – *Ann. Bot. Fennici* **156**: 1-21.
- LIMPRICHT, K. G. 1890-1895. Die Laubmoose Deutschlands, Oesterreichs und der Schweiz. II. Bryineae (Stegocarpeae [Acrocarpeae, Pleurocarpeae excl. Hypnaceae]). – *Leipzig*, 853.
- LOESKE, L. 1906. Bryologisches vom Harze und aus anderen gebieten. – *Abhandl. Bot. Ver. Provinz Brandenburg* **47**: 317-344.
- OCHI, H. 1962, 1963. Contributions to the mosses of Bartramiaceae in Japan and the adjacent regions 1, 2. – *Nova Hedwigia* **4**: 87-108, Tab. 38-49; **5**: 91-115, Tab. 9-26.
- SCHIMPER, W. P. 1876. Synopsis muscorum Europaeorum praemissa introductione de elementis bryologicis tractante. Ed. 2. *Stuttgartiae*. **1-2**, cxxx+886, 8 pls.
- WARNSTORF, C. 1906. Kryptogamenflora der Mark Brandenburg und angrenzender Gebiete. Laubmoose. – *Leipzig, Verlag von Gebrüder Borntraeger*, xii+1160.
- WIJK, R. van der, W. D. MARGADANT & P. A. FLOR-SCHÜTZ 1967. Index muscorum, 4 (P-S). – *Regnum Vegetabile* **48**: 1-604.