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Synopsis and nomenclature of *Thuidium* and related genera in China

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The genera *Thuidium* Bruch & Schimp. and *Pelekium* Mitt. have ten species in China, and the genera *Aequatoriella* A. Touw and *Bryochenea* C. Gao & K.C. Chang have one species each. The generic and specific nomenclature of these taxa in China is compared and a list of recommended names is given. *Pelekium microphyllum* (Schwaegr.) T.J. Kop. & A. Touw (*Haplohymenium microphyllum* Schwaegr.) is a new combination. The status of *Thuidium unipinnatum* Y.-M. Fang & T.J. Kop. and the genus *Bryochenea* need further study.

Key words: *Aequatoriella*, *Bryochenea*, China, Musci, nomenclature, *Pelekium*, *Thuidium*

In the years 2001 and 2002 the Chinese species of *Thuidium* (*s. lato*) were dealt with in three different papers. Fang and Koponen (2001) published a revision of *Thuidium*, *Haplocladium*, and *Claopodium* of China. Touw (2001a, 2001b) presented a realignment of genera traditionally accommodated in *Thuidium* and related genera, and a taxonomic revision of the Thuidiaceae of tropical Asia, the western Pacific, and Hawaii. Wu *et al.* (2002) treated the family Thuidiaceae in the *Moss flora of China* (English version). Touw in his studies, however, took into consideration only the taxa present in southern China, and some species with a northern distribution were excluded. The nomenclature in those three revisions is partly in agreement but in many cases differs both at the generic and specific levels, which is rather confusing. The names used in the four publications are given in Table 1, with annotations. Only the taxa recorded from China are taken into consideration.

Recommended names for Chinese *Thuidium* and some related genera

The following list accepts the generic concept proposed by Touw (2001a) and is based on Table 1 and annotations 1–7.

Aequatoriella A. Touw

A. bifaria (Bosch & Sande Lac.) A. Touw

Table 1. Comparison of the names in (A) Fang and Koponen (2001); in (B) Wu *et al.* (2002); and in (C) Touw (2001a, 2001b). – = not recorded. ( ) = not recorded from China.

A	B	C
Thuidium subgen. ***Thuidium***	***Thuidium***	***Thuidium***
T. tamariscinum (Hedw.) B.S.G.	*T. tamariscinum*	–
T. cymbifolium (Dozy & Molk.) Dozy & Molk.	*T. cymbifolium*	*T. cymbifolium*
T. philibertii Limpr.	*T. assimile* (Mitt.) Jaeg.	*T. assimile*
T. delicatulum (Hedw.) Schimp.	*T. delicatulum*	–
T. kanedae Sakurai	*T. kanedae*	–
T. submicropteris Cardot	*T. submicropteris*	–
T. pristocalyx (Müll. Hal.) A. Jaeger	*T. pristocalyx*	*T. pristocalyx* var. *pristocalyx* + var. *orientale* (Mitt.) A. Touw
T. subglaucinum Cardot	*T. subglaucinum*	*T. subglaucinum*
–	*T. glaucinoides* Broth. (1)	–
–	*T. plumulosum* (Dozy & Molk.) Dozy & Molk. (2)	–
–	–	*T. pseudoglaucinum* A. Touw
		Genus ***Pelekium***
–	*T. erosifolium* S.-Y. Zeng	*P. erosifolium* (S.-Y. Zeng) A. Touw
subgen. ***Microthuidium*** Limpr.	Genus ***Cyrto-hypnum*** Hampe & Lor.	
T. bonianum Besch.	*C. bonianum* (Besch.) W.R. Buck & Crum	*P. bonianum* (Besch.) A. Touw
T. haplohymenium (Harv.) A. Jaeger	*C. microphyllum* (Schwaegr.) P.-C. Wu, Crosby & S. He (3)	*P. haplohymenium* (Harv.) A. Touw
T. fuscatum Besch.	*C. fuscatum* (Besch.) P.-C. Wu, Crosby & S. He	*P. fuscatum* (Besch.) A. Touw
T. sparsifolium (Mitt.) A. Jaeger (4)	= *C. tamariscellum* (Müll. Hal.) W.R. Buck & Crum (4)	= *P. versicolor* (Müll. Hal.) A. Touw
T. kuripanum (Dozy & Molk.) R. Watan. (5)	*C. gratum* (P. Beauv.) W.R. Buck & Crum	*P. gratum* (P. Beauv.) A. Touw
T. tamariscellum (Müll. Hal.) Bosch & Sande Lac. (4)	*C. tamariscellum* (4)	*P. versicolor*
T. pygmaeum B.S.G.	*C. pygmaeum* (Schimp.) W.R. Buck & Crum	(*P. pygmaeum* (Schimp.) A. Touw)
T. unipinnatum Y.-M. Fang & T.J. Kop. (6)	–	–
–	*C. contortulum* (Mitt.) P.-C. Wu, Crosby & S. He	*P. contortulum* (Mitt.) A. Touw
–	*C. minusculum* (Mitt.) W.R. Buck & Crum	*P. minusculum* (Mitt.) A. Touw
–	*C. versicolor* (Müll. Hal.) W.R. Buck & Crum	*P. versicolor* (Müll. Hal.) A. Touw
		Genus ***Bryochenea*** C. Gao & K.C. Chang (7)
T. vestitissimum Besch.	*C. vestitissimum* (Besch.) W.R. Buck & Crum	*B. vestitissima* (Besch.) A. Touw
	Genus ***Pelekium***	Genus ***Pelekium***
–	*P. velatum* Mitt.	*P. velatum*
		Genus ***Aequatoriella***
–	*P. bifarium* (Bosch & Sande Lac.) M. Fleisch.	*A. bifaria* (Bosch & Sande Lac.) A. Touw

Bryochenea C. Gao & K.C. Chang

B. vestitissima (Besch.) A. Touw

Pelekium Mitt.

P. bonianum (Besch.) A. Touw
P. contortulum (Mitt.) A. Touw
P. erosifolium (S.-Y. Zeng) A. Touw
P. fuscatum (Besch.) A. Touw
P. gratum (P. Beauv.) A. Touw
P. microphyllum (Schwaegr.) T.J. Kop. & A. Touw
P. minusculum (Mitt.) A. Touw
P. pygmaeum (Schimp.) A. Touw
P. velatum Mitt.
P. versicolor (Müll. Hal.) A. Touw

Thuidium Bruch & Schimp.

T. assimile (Mitt.) Jaeg.
T. cymbifolium (Dozy & Molk.) Dozy & Molk.
T. delicatulum (Hedw.) Schimp.
T. kanedae Sakurai
T. plumulosum (Dozy & Molk.) Dozy & Molk.
T. pristocalyx (Müll. Hall.) A. Jaeger
var. *pristocalyx*
var. *orientale* (Mitt.) A. Touw
T. pseudoglaucinum A. Touw
T. subglaucinum Cardot
T. submicropteris Cardot
T. tamariscinum (Hedw.) B.S.G.

Annotations

The numbers refer to those in parentheses in Table 1.

1. The presence of *Thuidium glaucinoides* in continental Asia and East Asia is unlikely (Touw 2001b). Four Chinese collections previously identified '*Thuidium glaucinoides*' were identified by the second author as follows:
   a. *C.-C. Chuang 1069* (NY) contains *T. pristocalyx s.stricto*.
   b. Guangdong, *Tate s.n.* (BM, NY) = *T. pristocalyx* var. *orientale*.
   c. Fujian, *H. H. Chung B 290* (BM, FH, US) = *T. pristocalyx* var. *orientale*.
   d. Taiwan, *C.-C. Chuang 983* (NY), two sets, contain *T. pristocalyx* var. *orientale* and *T. assimile*, respectively.

   The two latter specimens were cited as *Thuidium glaucinoides* by Wu *et al.* (2002). However, we have not studied all the vouchers cited by them.

2. Wu *et al.* (2002) recorded *Thuidium plumulosum* from Fujian and Xizang provinces but Touw (2001b) did not list it from China. Two collections previously identified as *T. plumulosum* are:
   a. Taiwan, *Yang et al. 2822* (B) = *T. cymbifolium*.
   b. Fujian, *H. H. Chung B 142* (US) = *T. cymbifolium*.

   The latter specimen is a duplicate of the specimen cited by Wu *et al.* (2002).

3. Touw (2001b) treated *Leskea microphylla* Schwaegr. as a *nomen rejiciendum*. We agree with the opinion of Wu *et al.* (1999) that "there is nothing to block the use of Schwaegrichen's "*microphyllum*" in *Cyrto-hypnum*", or in *Pelekium,* either.

Pelekium microphyllum (Schwaegr.) T.J. Kop. & A. Touw, *comb. nova*

Haplohymenium microphyllum Schwaegr., Sp. Musc. Suppl. 3, 2(1) [pages not numbered], *pl. 271*. 1829. — *Cyrto-hypnum microphyllum* (Schwaegr.) P.-C. Wu, Crosby & S. He, Chenia 6: 7. 1999.

4. Touw (2001b) synonymized *Hypnum tamariscellum* and *Leskea sparsifolia* with *Pelekium versicolor* and Wu *et al.* (2002) synonymized *Leskea sparsifolia* with *Cyrto-hypnum tamariscellum*.
5. Wu *et al.* (2002) did not see *Thuidium kuripanum* specimens from China and did not list it as a synonym of *Cyrto-hypnum gratum*. However, they knew the probable synonymy through a personal communication with A. Touw (Wu *et al.* 1999).
6. *Thuidium unipinnatum* Y.-M. Fang & T.J. Kop., Bryobrothera 6: 38, *figs. 17, 18*. 2001. — *Cyrto-hypnum unipinnatum* (Y.-M. Fang & T.J. Kop.) W.R. Buck, Bryologist 104: 501. 2001.

The strongly branched pseudoparaphyllium illustrated in fig. 17h of Fang and Koponen (2001) seems to suggest *Haplocladium* rather than *Thuidium* subgen. *Microthuidium,* or *Pelekium*. The choice for *Thuidium* subgen. *Microthuidium* rests in fact on pluripapillose vs. smooth apical branch leaf cells, since a delicate appearance and autoicous sexuality are common in both genera. As both apical cell states are present in *Thuidium s. lato*, and not rarely in a single species or even in a single specimen, it might not be surprising to find pluripapillose apical branch leaf cells in a species of *Haplocladium* as well. The status of *Thuidium unipinnatum* cannot be solved satisfactorily before a taxonomic revision of East Asian *Haplocladia* has been made, based on as much material as can be assembled.

7. The status of the genus *Bryochenea* needs to be confirmed. When describing the genus, Gao and Chang (1982) described *B. ciliata* and combined to *Bryochenea* a second species, *Thuidium sachalinense* (= *Helodium sachalinense*) as *Bryochenea sachalinensis*. O'Brien (1993) and Wu and Jia (2000) studied the type of *Bryochenea ciliata,* and came to different conclusions of its identity. O'Brien (1993) and later O'Brien and Horton (2000) synonymized it with *Thuidium vestitissimum* Besch. (= *Cyrto-hypnum vestitissimum*), but Wu and Jia (2000) synonymized it with *Bryonoguchia molkenboeri*. Wu *et al.* (2002) accepted the latter solution, while Touw (2001b) agreed with the former synonymization. Touw did not have the type of *Bryochenea ciliata* at his disposal and he trusted the synonymization by O'Brien (1993).

On the basis of the description of *Bryochenea ciliata,* differences exist between it and *Thuidium vestitissimum*. The specimens studied of the latter (Koponen 1990, Touw 2001b) have shorter stems and far shorter leaves. The stem leaves are at most loosely appressed and have shorter and wider leaf cells; the leaves of ultimate branchlets are coarsely mammillose-serrate. Moreover, we have not seen in *T. vestitissimum* a leaf like the one illustrated by Gao and Chang (table 2: 5). We also point out that such a leaf shape was not illustrated for *T. vestitissimum* in other publications (Watanabe 1972: pl. 6, Noguchi 1991: fig. 380A as *T. lepidoziaceum*, Fang & Koponen 2001: fig. 11A–F as *T. vestitissimum,* Touw 2001b: fig. 19 as *Bryochenea vestitissima*). Comparison of the cited illustrations and plate 460 in Wu *et al.* (2002) gives the impression that their illustration is based on a misidentified specimen.

There seems to be even larger differences between *Bryochenea ciliata* and *Bryonoguchia molkenboeri*. The latter has stems bearing branched uniseriate paraphyllia and numerous very large, foliose appendages, which often are strap-shaped and fringed with structures identical in shape to the uniseriate paraphyllia. The stem leaves are even longer (up to 2 mm) than in *Bryochenea ciliata,* with branched appendages at the margins, and with wider leaf cells bearing large spiniform papillae (Watanabe 1972: pl. 31, Noguchi 1991: fig. 388). The leaves of the ultimate branchlets are spinose–serrate and also have very strong papillate laminal cells. Its perichaetial leaves (up to 5 mm), and setae (up to 5 cm) are much longer, and judging from descriptions and illustrations in the literature, its opercula are acute or rostellate instead of rostrate.

Accordingly, the specific and generic status of *Bryochenea ciliata* remains obscure. It has been synonymized with two different species belonging to two different genera. To us it seems more closely related to *Thuidium vestitissimum* (= *Bryochenea vestitissima*). However, it is possible that *B. ciliata* represents something completely different, but this cannot be solved without studying its type.

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