

## Taxonomic notes on *Metasasa* and *Indocalamus nanunicus* (Poaceae: Bambusoideae)

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Based on comprehensive field observations and careful herbarium studies, we discuss the status of the type species of *Metasasa* W. T. Lin (*M. carinata* W. T. Lin) and entities previously treated as synonyms of its name. Three species in two genera were involved. First, *M. carinata* and *M. albofarinosa* W. T. Lin were confirmed to be conspecific and a new combination *Acidosasa carinata* (Lin) D. Z. Li & Y. X. Zhang is proposed. Secondly, although *M. carinata* was previously treated as a synonym of *Acidosasa nanunica* (McClure) C. S. Chao & G. Y. Yang, close morphological study revealed that these two are not conspecific. *Pseudosasa nanunica* (McClure) Z. P. Wang & G. H. Ye is restored to accommodate this distinct species. Finally, another name previously treated as a synonym of *A. nanunica*, *Pseudosasa acutivagina* T. H. Wen & S. C. Chen should also be resumed. Synonyms are provided for each of these three species.

Because of the rarity of flowering, some species of bamboos have been described based on vegetative materials alone. However, the vegetative parts are variable among individuals in different phases of development and in different habitats. It is crucial to identify species with a comprehensive collection and careful observations in the field (Soderstrom and Young 1983, Li 1997a). However, incomplete collection of bamboo is often inevitable, which has made it very difficult to clarify the identity of some species.

In the course of a molecular phylogenetic study of the temperate bamboos, we examined the type specimens of *Metasasa carinata* W. T. Lin and *Pseudosasa acutivagina* T. H. Wen & S. C. Chen, as well as the type of *Indocalamus nanunicus* McClure (whose photo was compared), and collected additional specimens (those of the former two taxa being collected in their type localities). Although they were treated as a single entity by Yang and Chao (2001) and followed by Li et al. (2006), our investigation revealed that they are in fact three different species in two genera.

### The genus *Metasasa* and its type species *M. carinata*

*Metasasa* W. T. Lin was erected as a small genus of Bambusoideae by Lin (1988) to accommodate a newly described species, *M. carinata*. A second species, *M. albofarinosa* W. T. Lin, was added later (Lin 1990). The two names were described based on materials from Guangdong, south China. Lin (1990) described *M. albofarinosa* as having shorter internodes, dense white

powder under nodes, setae only at the base of culm sheaths, and drill-like culm blades, and stressed that those features made it distinguishable from *M. carinata*. After careful examination of the type specimens of those two species in the herbarium of South China Agricultural Univ. (CANT) and our collection and observations in the field (both near the type localities), we confirmed that they are in fact conspecific, as suggested by Yang and Chao (2001). We noticed that *M. carinata* also has dense white powder under nodes, while Lin (1988) missed this in his original description. We infer that this was a result of untypical specimens and poor records of the type collection of *M. carinata*. Other differences may occur due to diversified habitats.

While studying *Metasasa* and *I. nanunicus*, Yang and Chao (2001) suggested that the two-branched *Metasasa* was collected from abnormal plants of the type specimen of *M. carinata*. They compared the vegetative features of *M. carinata* and *I. nanunicus* and treated them as conspecific. As a result, *I. nanunicus* was transferred to *Acidosasa* C. D. Chu & C. S. Chao ex Keng f. During our study, two small populations of *M. carinata* near the type locality were observed, one of which was flowering. Those individuals are mostly two-branched per node at mid-culms, and one-branched at the base of the culms. The two-branched node is not an exception but rather quite common in this species, although we did observe some three-branched individuals (with a bigger branch in the middle and two smaller lateral branches) in Dawuling, Xinyi City, Guangdong Province. Therefore, the number of branches and the branching pattern are the primary differences between *M. carinata* and

*I. nanunicus*. Other noticeable differences include culm blades reflexed in *M. carinata* versus erect in *I. nanunicus*, and the length of ligules of culm sheaths and leaves (3–5 mm in *M. carinata* vs 7–9 mm in *I. nanunicus*).

*Metasasa* has semelauctant inflorescences, six stamens, lemmas much larger than paleas, mainly two unequal branches per node, and leptomorphic rhizomes. Those features resemble *Acidosasa* except in the number of branches per node (*Acidosasa* has three). Therefore, *Metasasa* has been treated as a synonym of *Acidosasa* by some authors (Li 1997a, 1997b, Yang and Chao 2001, Li et al. 2006). The generic affinity is confirmed by our field and herbarium studies. However, a new combination is required.

***Acidosasa carinata* (W. T. Lin) D. Z. Li & Y. X. Zhang comb. nov.**

**Basionym:** *Metasasa carinata* W. T. Lin, Acta Phytotax. Sin. 26 (1988, p. 145). **Type:** China. Guangdong, Xinhui, Gudoushan, 25 Jun 1986, X. B. Ye 35630 (holotype: CANT!).

**Taxonomic synonym:** *Metasasa albofarinosa* W. T. Lin (1990, p. 19), ('albo-farinosa'). **Type:** China. Guangdong, Xinyi, Dawuling, 12 Apr 1987, Z. M. Wu 0233 (holotype: CANT!).

**Distribution**

*Acidosasa carinata* is endemic to south Guangdong. It grows in open fields, forest understory, and on slopes of hills from ca 33–1660 m a.s.l.

**Additional specimens examined**

China. Guangdong: Xinhui, Gudoushan, 25 Jun 1986, X. B. Ye 35627, 35628 (CANT), 6 Dec 1985, G. Z. Chen 25061 (CANT), 15 Jun 1988, Z. M. Wu 88006 (CANT), 30 Apr 2008, Y. X. Zhang & Z. Xu 08031 (KUN), 08032 (KUN); Xinyi, Dawuling, 4 May 2008, Y. X. Zhang & Z. Xu 08040 (KUN).

**The status of *Indocalamus nanunicus***

The type specimen of *Indocalamus nanunicus* McClure was collected from an introduced living plant in the Lingnan Univ. (now Sun Yat-Sen Univ.) in Guangdong without inflorescences. There was a solitary branch per node in the type specimen. However, McClure (1940) wrote that "as long as the plants remain dwarfed by unfavorable growing conditions the branches remain solitary at the culm nodes. The original plants which were growing wild along a stream, under favorable conditions, reached a height of about 4 meters and often produced the primary branches in threes." The genus *Indocalamus* Nakai usually bears solitary branches at the nodes, while the genera *Arundinaria* Michx. (s.l.) and *Pseudosasa* Makino ex Nakai (s.l.) produce three branches per node. Therefore, this species was transferred to *Arundinaria* by Chao and Chu (1980) and *Pseudosasa* by Wang and Ye (1981), respectively.

In the bamboo account of 'Flora of China', *Arundinaria* was treated to include *Bashania* Keng f. & T. P. Yi. However, according to our molecular study (Zeng et al.

2010), the genus *Arundinaria* should be delimited more narrowly, i.e. comprising three species confined to eastern USA only. The inflorescence of *I. nanunicus* is unknown, but the primary vegetative features, such as three subequal branches per node, branches appressed to culms, culm sheaths shorter than internodes, and ligules of the culm sheaths 7–9 mm long, suggest an affinity with *Pseudosasa* subg. *Sinicae* S. L. Chen & G. Y. Sheng, rather than *Bashania*. Based on these observations, we propose to restore *Pseudosasa nanunica* (McClure) Z. P. Wang & G. H. Ye.

When *I. nanunicus* was transferred to *Acidosasa*, Yang and Chao (2001) put several synonyms under this name and this was mostly followed by the recently published bamboo account of 'Flora of China' (Li et al. 2006). One of the synonyms, *Pseudosasa acutivagina* T. H. Wen & S. C. Chen was treated as an independent species in the Flora but with notes saying that it is possibly a synonym of *A. nanunica*. We examined the type specimen of *P. acutivagina* and many other specimens, particularly the type materials of other species names that were considered as synonyms of *A. nanunica*. We confirmed that *P. acutivagina* is morphologically different from the others, whereas the other names are indeed synonyms of *P. nanunica*. In addition, our molecular study (Zeng et al. 2010) also supported *P. acutivagina* as a distinct species. Therefore, we propose to maintain *Pseudosasa acutivagina* T. H. Wen & S. C. Chen.

***Pseudosasa nanunica* (McClure) Z. P. Wang & G. H. Ye (1981, p. 97)**

**Basionym:** *Indocalamus nanunicus* McClure, Lingnan Univ. Sci. Bull. 9 (1940, p. 25).

**Based on the same type:** *Arundinaria nanunica* (McClure) C. D. Chu & C. S. Chao (1980, p. 26). – *Acidosasa nanunica* (McClure) C. S. Chao & G. Y. Yang in Yang and Chao (2001, p. 66) syn. nov.

**Type:** China. Kwangtung (Guangdong), Ts'ing-yuen Dist. (Qingyuan), Heung Lo Keuk village, 13 Oct 1937, F. A. McClure 20624 (holotype: US!; photo: KUN).

**Taxonomic synonyms:** *Pseudosasa altiligulata* T. H. Wen (1989, p. 18) syn. nov. **Type:** China. Hunan, Yiyang, 6 Jun 1984, S. C. Chen Cx84663 (holotype: ZJFI!).

– *Arundinaria projecta* W. T. Lin (1990, p. 16) syn. nov.

**Based on the same type:** *Pseudosasa projecta* (W. T. Lin) P. C. Keng in Geng and Song (1994, p. 65). **Type:** China. Guangdong, Jiexi, Heshe, 26 Jun 1987, Z. J. Feng 80595 (holotype: CANT!).

– *Pseudosasa nanunica* (McClure) Z. P. Wang & G. H. Ye var. *angustifolia* S. L. Chen & G. Y. Sheng, Bull. Bot. Res. north east. Forest. Inst. 11 (1991, p. 45) syn. nov. **Type:** China. Hunan, Chengbu, Qingjieshan, 500 m a.s.l., 4 Jun 1977, Z. P. Wang et al. 77039 (holotype: NAS!).

– *Acidosasa paucifolia* W. T. Lin (1992, p. 352) syn. nov. **Type:** China. Guangdong, Yingde, Lianjiangkou, 9 Dec 1987, M. Y. Xiao 54458 (holotype: CANT!).

– *Acidosasa xiushanensis* T. P. Yi (1992, p. 49) syn. nov. **Type:** China. Chongqing, Xiushan, 270 m a.s.l., 10 Nov 1991, T. P. Yi 91432 (holotype: SIFS!).

– *Arundinaria bicorniculata* W. T. Lin & Z. J. Feng (1993, p. 50) syn. nov. **Type:** China. Guangdong, Pingyuan,

Nantaishan, 400 m a.s.l., 10 May 1992, Z. J. Feng 83625 (holotype: CANT!).

### Distribution

*P. nanunica* occurs mainly in central and south China, especially in south Hunan and north Guangdong. It grows in the understory, on slopes of hills, in valleys or along streams.

### Additional specimens examined

China. Guangdong: Lechang, 28 Jul 1943, B. H. Liang et al. 84686 (IBSC), 84687 (IBSC); Pingyuan, 5 Dec 1991, Z. J. Feng 83493 (CANT), 19 May 1992, Z. J. Feng 84098 (CANT); Ruyuan, 1300–1400 m a.s.l., 8 Dec 1957, L. Deng 5907 (IBSC); Lianshan, 29 Apr 1978, Z. P. Wang and A. T. Liu 78036 (N). Hunan: Yizhang, Mangshan, 1957, Z. P. Wang et al. 77001 (N), 77007 (N), 540 m a.s.l., 24 Sep 1942, B. H. Liang 83674 (IBSC), 500 m a.s.l., 16 Oct 1942, S. Q. Chen 2516 (IBSC), 500 m a.s.l., 20 Oct 1942, S. Q. Chen 2706 (IBSC), ca 1300 m a.s.l., 20 May 2006, Y. X. Zhang et al. 06112 (KUN); Jinquan, Lingziping, 1100 m a.s.l., 27 Sep 1942, B. H. Liang 83732 (IBSC).

### *Pseudosasa acutivagina* T. H. Wen and S. C. Chen in Wen (1984, p. 31)

**Type:** China. Zhejiang, Qingyuan, Guanmenao, 8 Jun 1983, S. Q. Chen QY83053 (holotype: ZJFI!).

The culm sheaths of this species are longer than the internodes, with brown setae on the abaxial surfaces, and most dense at the base. Ligules of the culm sheaths are about 1 mm long. These characters clearly distinguish it from *P. nanunica* and *A. carinata*. Our molecular results (Zeng et al. 2010) illustrated that this species was nested in a clade different from the other two species.

### Distribution

This species occurs in Zhejiang, China. It usually grows on slopes below 500 m a.s.l.

### Additional specimens examined

China. Zhejiang: Qingyuan, Guanmenao, 17 Nov 1985, S. Q. Chen CQ85119 (ZJFI), 30 May 1986, S. Q. Chen QY86561 (ZJFI), 2 Jul 2006, Y. X. Zhang et al. 06184 (KUN), 06186 (KUN).

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