Taiwania, **49**(3): 201-208, 2004

The Identity of *Camellia buisanensis* Sasaki (Theaceae)

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(Manuscript received 20 July, 2004; accepted 19 August, 2004)

ABSTRACT: *Camellia buisanensis* Sasaki was first described in 1931. Unfortunately, the type specimen had been lost since its first discovery and there were no relevant materials for re-examination. Therefore, its identity is dubious. This long lost tea species was rediscovered this year at Mt. Jenlishan in southern Taiwan. However, after careful comparison, *C. buisanensis* is morphologically much more similar to the genus *Pyrenaria* than to *Camellia*. Consequently the species is treated as a new combination as *Pyrenaria buisanensis* (Sasaki) C. F. Hsieh, S. Z. Yang and M. H. Su. Besides taxonomic treatment, historical status of this species is provided here. A key to Taiwanese *Pyrenaria* and a line-drawing are also provided. Due to its endangered status, extraordinary restoration efforts are urgently needed to save this species.

KEY WORDS: ***Camellia buisanensis, Pyrenaria buisanensis*, Theaceae, *Camellia, Pyrenaria*, Typification, Flora, Taiwan.**

INTRODUCTION

Camellia, a large genus of Theaceae, contains about 119 species widely distributed in tropical and subtropical regions of East and Southeastern Asia (Ming, 2000). There are twelve native species known to exist in Taiwan (Hsieh *et al*., 1996). Most species are well known among taxonomists except for the species, *Camellia buisanensis* Sasaki.

C. buisanensis was first described in 1931 by a Japanese botanist S. Sasaki. Unfortunately, the type specimen had been lost since Sasaki's time, and there were no any other relevant herbarium specimens for re-examination (Lu and Yang, 1987; Hsieh *et al*., 1996). Consequently, different opinions have arisen regarding to the status of this species. Kanehira (1936) first treated *C. buisanensis* as a synonym of *C. caudata* Wall. This treatment was followed by Chang and Ren (1998), and Ming (2000). Keng (1950) doubted the existence of the species. In their revisions of Taiwanese Theaceae, *C. buisanensis* was no longer recognized by Yamamoto and Mori (1934), Liu (1962) and Li (1976). Lu and Yang (1987) thought that there was very little difference between *C. buisanensis* and *C. sinensis* (L.) O. Ktze. form. *formosensis* Kitamura, and so combined the two as a single taxon and reduced the species to subspecific rank as *C. sinensis* subsp. *buisanensis* (Sasaki) Lu & Yang.

Based on the original description made by Sasaki (1931), *C. buisanensis* can be easily distinguished from *C. caudata* by its elliptic and glabrous leaves, sulcate midribs, larger sepals, and sepals and petals being golden-puberulent on the outside. *C. buisanensis* is also clearly discerned from *C. sinensis* form. *formosensis* by its pubescent buds, short pedicels and pubescent ovaries. Due to these differences some taxonomists (Liu and Lu, 1967; Liu *et al*., 1994; Hsieh *et al.*, 1996) still agreed with Sasaki's treatment, and retained it as a distinct species.

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During the course of a vegetation survey conducted by a team from the National Pingtung University of Science and Technology in January 2004, an unknown Theaceae plant was found at Mt. Jenlishan in Pingtung County, southern Taiwan. The specimens were collected again by the first author in March from the same location. When referring to the original descriptions made by Sasaki, surprisely the new plant turned out to be *C. buisanensis* which was lost for over 70 years.

However, the rediscovery of *C. buisanensis* gave us the chance to reconsider the taxonomic position of this species within the family. Morphologically, *C. buisanensis* is much more similar to the genus *Pyrenaria* than to *Camellia*. *Pyrenaria* and *Camellia* are closely related groups in phylogeny. This has been verified not only in morphological studies (Keng 1962; Luna and Ochoterena, 2004), but also from other approaches such as the palynology (Wei, 1997), floral development (Tsou, 1998), karyotype (Yang, 2000) and molecular biology (Prince and Park, 2001). Actually, some species formerly identified as *Camellia* were subsequently renamed as *Pyrenaria*. Traditionally, the major difference between them is fruit type. Fruits of *Pyrenaria* are drupaceous or capsules dehiscent from base, while those of *Camellia* are all capsules dehiscent from apex. Recently, a simple but important character has been employed by Yang (2000) to distinguish species of these two genera, that is the hilums of *Camellia* seeds are spotted, while those of *Pyrenaria* are linear. Seeds of the newly found *C. buisanensis* reveal the same type of hilums as *Pyrenaria*, and this together with other characters strongly suggest that *C. buisanensis* should be treated as a member of *Pyrenaria*.

TAXONOMIC TREATMENT

Pyrenaria buisanensis (Sasaki) C. F. Hsieh, S. Z. Yang and M. H. Su, **comb. nov.**

NEOTYPE (designated here): Taiwan, Pingtung Co., Mt. Jenlishan, elev. 900-1000 m, 30 May 2004, flowering, *K. T. Lee and Y. K. Wu s. n.* (TAI). Figs. 1-3

Camellia buisanensis Sasaki in Trans. Nat. His. Soc. Form. 21: 222. 1931; Liu and Lu in Exp. For. Nat. Taiwan Univ. Tech. Bull. 52: 16. 1967; Liu, Lu & Ou in Tree. Taiwan 427. 1994; Hsieh, Yanf & Lin in Fl. Taiwan 2nd. ed. 2: 668. 1996.
Thea buisanensis (Sasaki) Metcalf in Lingnan Sci. J. 12(1): 180. 1933.
Camelliastrum buisanensis (Sasaki) Nakai in J. Jap. Bot. 16: 700. 1940.
Camellia sinensis (L.) O. Ktze subsp. *buisanensis* (Sasaki) Lu & Yang in Quart. J. Chin. For. 20(1): 106. 1987. (excluding descriptions, figures, neotype: TAIWAN. Pingtung Co., Mt. Buwi, *Matsuda s. n.*, Jan. 1, 1919, TAIF!)
Tutcheria taiwanica H. T. Chang & S. X. Ren in Acta Sci. Nat. Univ. Sunyats. 30(1): 71. 1991, et in Fl. Reip. Pop. Sin. 49(3): 205. 1998. -HOLOTYPE: Taiwan**:** Pingtung Co., Bankinsing, Feb. 25, 1893-1894, *A. Henry 123* (US!).

Medium evergreen trees, up to 15 m high. Bark brown-reddish, with thin and irregular slices. New branches pale green and more or less hairy, then turning pale brown and glabrous; winter buds golden-puberulous, 3-7 mm long. Leaves alternate, more or less clustered, thick-coriaceous, elliptic or obovate, 6-11 (-15) cm long, 2.5-4 cm wide, obtuse at apex, cuneate at base, margins dentate or serrate, dull glabrous above, glabrous or slightly hairy beneath, midrib sulcate above, prominent beneath; petiole green or purple, 3-10 mm long, glabrous or slightly hairy. Flowers axillary, solitary, pedicels very short, 1-2 mm long; bracts 3-4, rotund, imbricate, unequal, 3-7 mm long, 3-10 mm wide, golden-puberulous, persistent; sepals 3, rotund, unequal, 3-12 mm long, 5-14 mm wide, deciduous, golden-puberulous outside; corolla white to pale-yellow, 2-3.5 cm across, petals 5, slightly incurved, 1.2-1.8 cm long, 1-1.5 cm wide, golden-puberulous outside; stamens many, sometimes 1-3 petaloid,

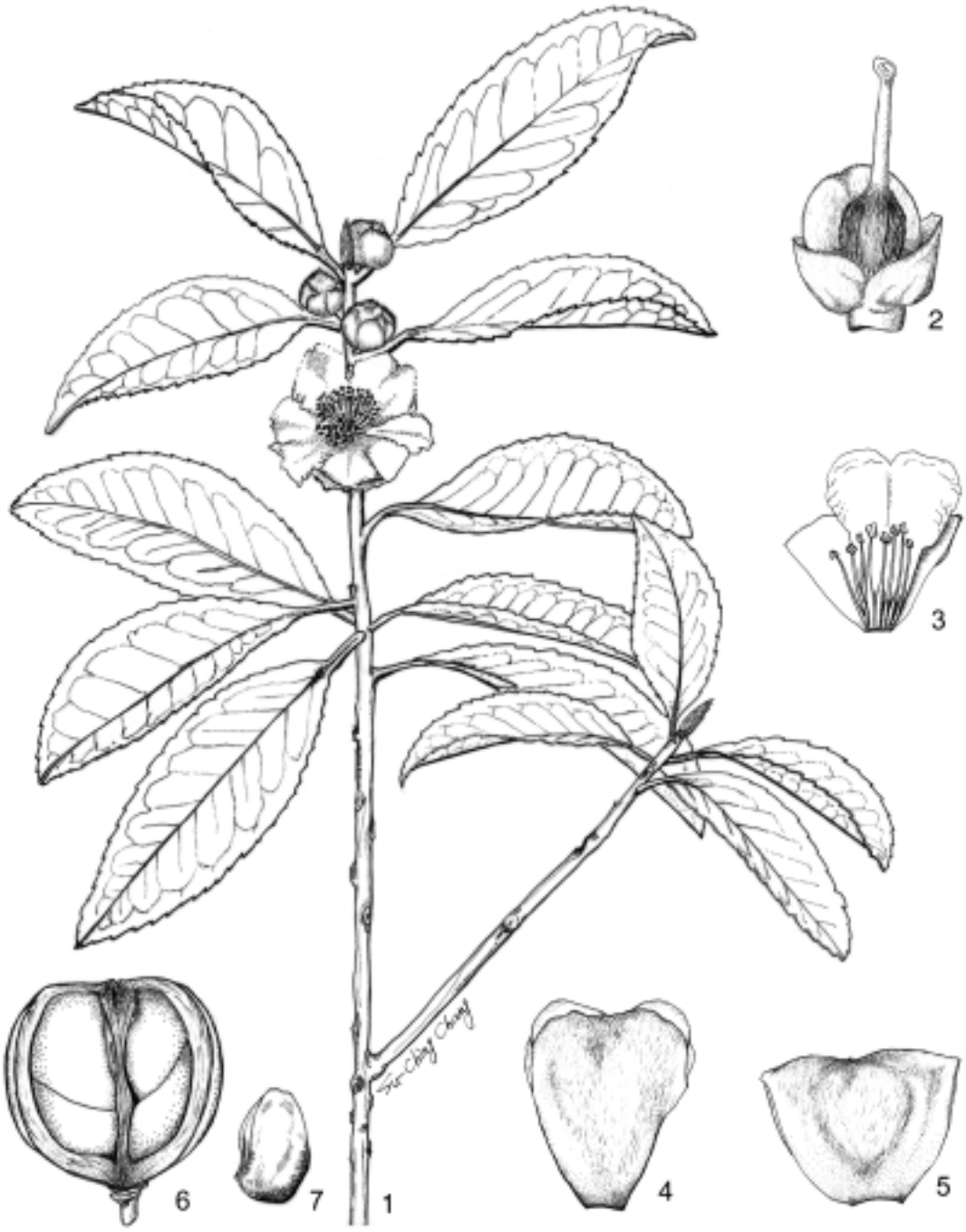

Fig. 1. *Pyrenaria buisanensis* (Sasaki) C. F. Hsieh, S. Z. Yang and M. H. Su (Theaceae). 1: flowering branch. 2: ovary with bracts. 3: normal stamens and a petaloid stamen. 4: petal outside. 5: sepal outside. 6: fruit. 7: seed.

filaments 8 mm long, basal united to petals; pistil 1, 4-8 mm long; ovaries 2-3 mm long, white-puberulous. Capsules 3-celled, ligneous, obovoid or slightly compressed globose, 2-2.5 cm across, pericarp 2-3 mm thick, white-puberulous when young, glabous when mature, 2-4 seeds in each cell. Seeds irregular, compressed, hard, brown-shiny, about 1 cm long; hilums linear.

Distribution: Endemic to Taiwan, only in southwestern part at low altitudes (under 1000 m).

Fig. 2. Flower and floral buds of *Pyrenaria buisanensis* (Sasaki).

Fig. 3. Fruiting branch of *Pyrenaria buisanensis* (Sasaki).

Specimens examined: TAIWAN. Pingtung Co., Bankinsing, Feb. 25, 1893-1894, *A. Henry 123* (Holotype of *Tutcheria taiwanica* H. T. Chang and S. X. Ren, US!); Mt. Jenlishan, elev. 900-1000 m, 10 Mar. 2004, *M. H. Su 542, 543* (TAI); same locality, Jan. 2004, *Yang s. n.* (PPI).

Notes: During 1893 and 1894, Augustine Henry (an Irish physician and plant collector) made large collections on the neighborhood of Bankinsing, a village situated at the base of the lofty Kalee Mountain. The locality is now known as Wanchin, 30 km east from Kaohsiung

City, and near the site where the holotype of *C. buisanensis* was collected. He published "A List of Plants from Formosa" in 1896, a monumental publication endeavoring to list all published plant names from Taiwan since 1854, when an English horticultural botanist Robert Fortune first visited Tanshui of northern Taiwan. In his paper, three native species of *Camellia* were listed, and one of them was undetermined. The referred specimen (deposited at the US National Herbarium, Smithsonian Institute) of the unknown species was numbered "123" by him and with a label reading "*Camellia* sp., Bankinsing". In 1991, a new species was published as *Tutcheria taiwanica* H. T. Chang and S. X. Ren based on Henry's unknown specimen. After examining the image of Henry's collection, we found that the specimen matched well with Sasaki's description and our newly collected specimens. Subsequently, we treated *T. taiwanica* as a synonym of *P. buisanensis*.

Later, Yang (2000) placed *T. taiwanica* into the synonym of *P. microcarpa* (Dunn) Keng var. *symplocifolia* (Merr. et Metc.) S. X. Yang. However, these two taxa are quite distinguishable on the basis of their fruits. In *P. buisanensis*, the fruits are obovoid or slightly compressed globose even in immature stage, whereas the fruits of *P. microcarpa* var. *symplocifolia* are longitudinally 2-4-ridged (Merrill and Metcalf, 1937). Moreover, fruits of these two taxa are different in size; i.e., > 2 cm vs. < 1.5 cm in diameter. It seems clear that the two entities should be treated as separate species.

Diagnosis: Originally, only one species of *Pyrenaria*, *P. shinkoensis* (Hayata) H. Keng, has been found in northern Taiwan (Keng, 1950, 1973; Liu and Lu, 1967; Li, 1976; Liu, *et al.*, 1994; Hsieh *et al*., 1996). When comparing the leaf shape, *P. buisanensis* is very similar to *P. shinkoensis*. However both species are readily distinguishable from each other by their bark surface, leaf flavor, pedicels and fruits. Key characters to distinguish these two species are provided as follows:

1. Bark with longitudinally shallow grooves; leaf smelled like almond; pedicel more than 5 mm long; fruit 3-ridged, less than 1.5 cm in diameter when mature …….. *P. shinkoensis*
1. Bark with thin and irregular slices; leaf smelled not like almond; pedicel less than 2 mm long; fruit not ridged, more than 2 cm in diameter when mature …….. *P. buisanensis*

Conservation: *P. buisanensis* was previously known only from two sites in southern Taiwan. The type specimen was collected in 1918 by Sasaki probably along a trail (below 1,400 m elevation) linking flat plain and aborginal villages around Mt. Buwi (now known as Mt. Tawujanshan, E 120°41'51", N 22°30'17"). The specimens collected by Henry (1896) were restricted to low elevation below 2,000 ft (ca. 700 m). At this time, *P. buisanensis* was also found in the southern mountains at about 1000 m elevation. Original forests within this range of elevation have been almost completely replaced by roads, cultivation and plantations. This must constitute the main threat to the species. The adjacent mountains near the collection sites have been searched recently, but no such plants or habitat have been found. Even on Mt. Jenlishan, however, only a few individuals left. This species should be put into the "CR" category according to IUCN rules (IUCN 2001). Hence specific monitoring of the current status of the habitat and extraordinary restoration efforts are urgently needed to save this species over the precipice of extinction.

ACKNOWLEDGEMENTS

We thank Dr. Chi-Hwa Tsou, Dr. Shi-Xiong Yang, Dr. Jenn-Che Wang, Mr. Shann-Jye Moore for providing information and very helpful comments, Mrs. Su-Ching Chang for the

line-drawing. We also thank two reviewers for improving the manuscript. This work was supported by the Forestry Bureau, Council of Agriculture, under the project "National Vegetation Biodiversity Inventory and Mapping Program in Taiwan".

LITERATURES CITED

Chang, H.-T. and S.-X. Ren. 1991. New species of Theaceae from Tropical Asia. Acta Sci. Nat. Univ. Sunyatseni **30**: 67-71.

Chang, H.-T. and S.-X. Ren. 1998. Theaceae (1): Theoideae. In: Chang, H.-T. (ed.). Fl. Reipubl. Popularis Sin. **49**: 192-193.

Henry, A. 1896. A list of plants from Formosa. Trans. Asiat. Soc. Jap. 4. Sup. p. 20.

Hsieh, C.-F., L.-K. Ling, and K.-C. Yang. 1996. *Camellia*, Theaceae. In: Boufford, D. E., C. F. Hsieh, T. C. Huang, H. Ohashi, and Y. P. Yang (eds.), Flora of Taiwan, Second Ed., Vol. 2. Edit. Comm. Fl. Taiwan., 2nd ed., Taipei, Taiwan. pp. 662-693.

Luna, I. and H. Ochoterena. 2004. Phylogenetic relationships of the genera of Theaceae based on morphology. *Cladistics* **20**: 223-270.

IUCN. 2001. IUCN Red List Categories and Criteria: Version 3.1. IUCN Species Survival Commission. IUCN, Gland, Switzerland and Cambridge, UK. pp. 14-15.

Kanehira, R. 1936. Formosan Trees. Department of Forestry, Government Research Institute, Formosa. p. 456.

Keng, H. 1950. The Theaceae of Taiwan. Taiwania **1**: 240-241.

Keng, H. 1962. Comparative morphological studies in Theaceae. Univ. Calif. Publ. Bot. **33**: 269-384.

Keng, H. 1973. Nomenclatural note on Wu Pi Cha or the black-barked tea plant. Taiwania **18**: 55-56.

Li, H.-L. 1976. Theaceae. In: Li, H.-L., T.-S. Liu, T.-C. Huang, T. Koyama and C. E. DeVol (eds.), Flora of Taiwan. Vol. 2. Epoch Publ. Co., Taipei, Taiwan. pp. 592-619.

Liu, T.-S. 1962. Illustrations of Native and Introduced Ligneous Plants of Taiwan. College of Agriculture, National Taiwan University, Taipei, Taiwan. pp. 230-254.

Liu, T.-S. and F.-Y. Lu. 1967. Studies in the Taiwan Theaceae based on the morphological characters of leaves. Experimental Forest of National Taiwan University Technical Bulletin **52**: 16.

Liu, Y.-C., F.-Y. Lu and C.-H. Ou. 1994. Trees of Taiwan. Monographic Publication No. 7, College of Agriculture, National Chung-Shing University, Taichung, Taiwan. p. 429.

Lu, S.-Y. and Y.-P. Yang. 1987. The wild tea of Taiwan. Quart. J. Chin. For. **20**: 101-107.

Merrill, E. D. and F. P. Metcalf. 1937. New Kwangtung plants. Lingnan Sci. J. **16**: 172.

Ming, T.-L. 2000. Monograph of the Genus *Camellia*. Yunnan Science and Technology Press, Kunming, China. pp. 200-204.

Prince, L. M. and C. Parks. 2001. Phylogenetic relationships of the Theaceae inferred from chloroplast DNA sequence data. Amer. J. Bot. **88**: 2309-2320.

Sasaki, S. 1931. Miscellaneous contributions to the flora of Formosa (X). Trans. Nat. His. Soc. Form. **21**: 222.

Tsou, C.-H. 1998. Early floral development of Camellioideae (Theaceae). Amer. J. Bot. **85**: 1531-1547.

Wei, Z.-X. 1997. Pollen ultrastructure of Theaceae and its systematic significance. Acta Bot. Yunnanica **19**: 143-153.

Yamamoto, Y. and K. Mori. 1934. Determination of the Formosan species of Ternstroemiaceae (Theaceae) based on the morphological characters of leaves. Sylvia **5**: 24-48.

Yang, S.-X. 2000. Systematics, diversification and geographical distribution of *Pyrenaria sensu lato* (Theaceae). Doctoral dissertation. Department of Phytotaxonomy & Phytogeography, Kunming Institute of Botany, The Chinese Academy of Sciences, Kunming, China. p. 95.

武威山茶分類地位之澄清（茶科）

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(收稿日期：2004 年 7 月 20 日；接受日期：2004 年 8 月 19 日)

摘　　要

臺灣植物誌中所記載的武威山茶 (*Camellia buisanensis* Sasaki) 在 1931 年發表之後，未曾有過其他植物學者的採集紀錄。尤有甚者，Sasaki 氏所指定的模式標本似乎已經遺失。因此，植物學家對其分類地位一直抱持不同的看法。2004 年元月，我們在屏東縣真笠山山區，發現一種未知的山茶科植物。經過比對，發現它的特徵完全符合 Sasaki 氏的描述，因而認定其為武威山茶。不過因為它的花果具有烏皮茶屬的特徵，因此我們將之組合成 *Pyrenaria buisanensis* (Sasaki) C. F. Hsieh, S. Z. Yang and M. H. Su，中名擬為武威山烏皮茶。本文除進行新的分類處理外，亦針對相關文獻及研究歷史做探討。同時，亦提供臺灣產烏皮茶屬植物的檢索表與本種植物之手繪圖。由於目前本種植物之數量寥寥可數，因此我們也強烈建議有關單位，應該即刻進行相關之保育措施，維持臺灣生物種類之歧異度。

關鍵詞：武威山茶、武威山烏皮茶、茶科、山茶屬、烏皮茶屬、模式化、植物誌、臺灣。

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