

Studies of *Eurya* (Ternstroemiaceae) in Taiwan (1), a new endemic species, *Eurya septata*

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(Received January 21, 2002; Accepted August 6, 2002)

Abstract. *Eurya septata* (Ternstroemiaceae) is described as a new species endemic to Taiwan. It is most similar to *E. chinensis*, a species common in Taiwan and southeast China. The new species can be separated from *E. chinensis* in having septate anthers, shorter pedicels, and more flowers per fascicle.

Keywords: Anther septation; *Eurya*; *Eurya chinensis*; *Eurya septata*; Taiwan; Taxonomy; Ternstroemiaceae.

Introduction

Ternstroemiaceae, traditionally treated as Ternstroemioidae in Theaceae (Keng, 1962; Cronquist, 1988; Dahlgren, 1989; Thorne, 1992; Takhtajan, 1997), were recently recognized as an independent family on the basis of large-scale DNA cladograms (APG, 1998; Judd et al., 1999; Prince and Park, 2001; Anderberg et al., 2002). In these cladograms, Ternstroemioidae and Camellioidae, the two subfamilies of Theaceae, always form two separate clades and have no sister relationships (APG, 1998; Savolainen et al., 2000; Soltis et al., 2000; Anderberg et al., 2002). *Eurya*, comprising about 130 species, is the largest genus in the Ternstroemiaceae. It is mainly distributed in tropical and subtropical Asia and the Pacific islands (Lin, 1998). Twelve species of *Eurya* are known in Taiwan (Hsieh et al., 1996) and constitute an important element in forests from low to mid elevations. This genus is easy to recognize by the following characters: plants of shrubs or small trees; leaves alternate, distichous, coriaceous, serrulate, usually 4-7 cm in length; flowers dioecious, small, axillary; sepals five; petals five, distinct; ovary superior; fruits small, ca. 5 mm in diameter, subglobose to globose. However, identification of species is often difficult because many species of *Eurya* are highly similar in gross morphology, and useful taxonomic characters are limited. In most herbaria in Taiwan, the determinations of collections of *Eurya* are usually chaotic, especially for those specimens filed under the names *E. acuminata*, *E. chinensis*, *E. emarginata*, *E. hayatai*, and *E. loquaiana*; in addition, use of the following names in Taiwan is not consistent among floristic treatments: *E. acuminata*, *E. hayatai*, *E. japonica*, *E. nanjenshansis*, and *E. taitungensis* (Li, 1976; Hsieh et al., 1996; Yang et al., 1997).

In our study, we examined nearly all the specimens of *Eurya* in the major herbaria of Taiwan. Among the numerous morphological characters we examined, as Lin (1966,

1998) has emphasized, anther septation appears to be one of the most reliable and useful characters in separating species of *Eurya*. Lin (1998) even used "anther septate or not septate" as the single criterion to divide *Eurya* into two subgenera. Among the species in Taiwan, *E. emarginata*, *E. glaberrima*, *E. gnaphalocarpa*, and *E. strigillosa* were recorded as having septate anthers, and the remaining species as having nonseptate anthers by Lin (1998). Our examination confirmed Lin's descriptions in this regard, but we noticed an interesting group of specimens that possessed septate anthers but did not match *E. emarginata*, *E. glaberrima*, *E. gnaphalocarpa*, or *E. strigillosa* in other features. This unknown species is similar to *E. chinensis* in most morphological characters but differs from it by having septate anthers, shorter pedicels, and more flowers per fascicle. This species is widely distributed in the western part of Taiwan (Figure 3).

This unknown species exhibits clear delimitations from all the existing species (Merrill, 1926; Kobuski, 1938; Walker, 1976; Hsieh et al., 1996; Lin, 1998; Yang et al., 1997), and, therefore, we are describing it as new to science.

Species Description

Eurya septata Chi C. Wu, Z. F. Hsu & C. H. Tsou, sp. nov.—TYPE: TAIWAN. Pingtung Hsien, Laufo Shan, elev. 350-500 m, 30 Dec 1999, *Chiu-Mei Wang 4057* (Holotype: HAST; Isotype: TNM; both with numerous male flowers). Figures 1 and 2

Arbuscula vel frutex, ramulis pubescentibus. Folia alterna, coriacea, elliptica, 2.5-10 cm longa et 1.8-4 cm lata, apice acuminata, basi cuneata, margine serrulata, petiolis 5-10 mm longis, pilosis. Flores 3-6, axillares, subsessiles vel pedicellis 0.4-1 mm longis, sepalis 5, inaequalibus, petalis 5, oblongis, glabris, staminibus 14-16, antheris apiculatis, septatis, ovario glabro, stylo 1 mm longo, tripartito. Fructus globosi, glabri, ca. 4 mm longi.

Small trees or shrubs; branchlets pubescent, slightly ridged, terminal buds pilose. Leaves alternate, distichous,

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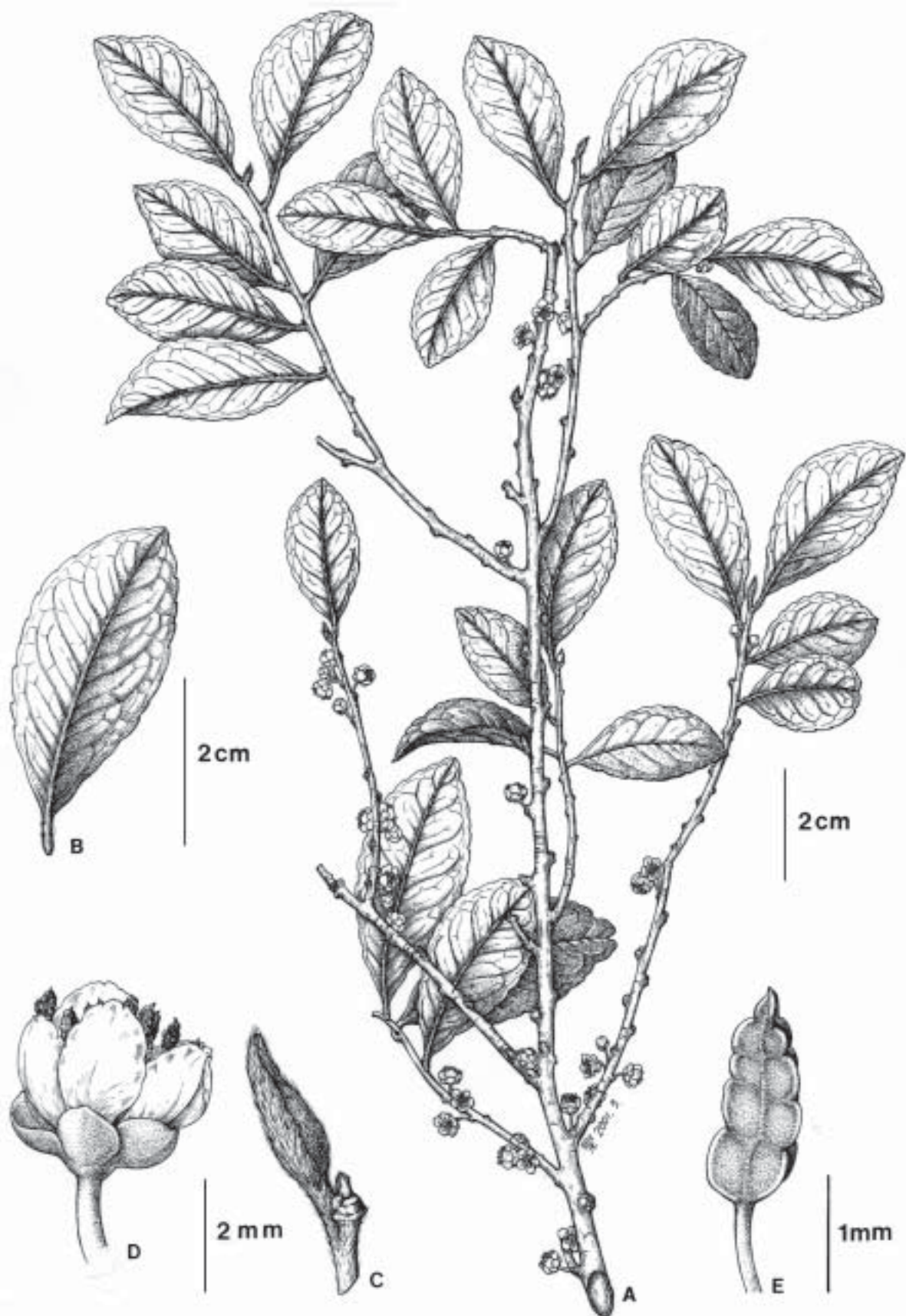


Figure 1. *Eurya septata*. A, Habit; B, An enlarged leaf; C, Staminate flower; D, Terminal bud with hairs; E, Septate anther. (from Type specimen: Wang, Chiu-Mei 04057)

firmly membranous to coriaceous, elliptic, 2.5-10 cm long, 1.8-4 cm wide, apex acuminate, base cuneate, midrib elevated and pilose beneath, margin serrulate, petioles 5-10 mm long, pubescent. Flowers axillary, 3-6 per fascicle, pedicels 0.4-1 mm long; sepals 5, subequal, ovate, abaxially glabrous or sometimes hirsute; petals 5, white, oblong, glabrous, free. Male flower: stamens 14-16, anthers sagittate, septate; ovary reduced. Female flowers: stamens 0; ovary glabrous; style 1 mm long; stigma trifid. Fruits globous, ca. 4 mm in diameter, glabrous, style persistent.

Additional specimens examined. **TAIWAN.** *Specimens with male flowers:* TAIPEI CITY: Yangmingshan, 20 Nov 1992, *Chiu & Chen 1249* (TNM). TAIPEI HSIEN: Kuanyin Hsiang, Kuanyinshan, elev. ca. 300 m, 27 Dec 2000, *Tsou 1453* (HAST), 28 Dec 2000, *Tsou 1471* (HAST); Yuantungssu, 16 Dec 2000, *Chiang 1624* (TAIF). HSINCHU HSIEN: Lienhuassu, elev. 50-100 m, 17 Jan 2001, *Chiang 1638* (TAIF); Wutsuishan, elev. 700-1,000 m, 22 Dec 1999, *Cheng 2826* (TAIF). MIAOLI HSIEN: Fayunssu, 24 Oct 1971, *Huang s. n.* (TCF); Huoyenshan, 18 Dec 1977, *Mou s. n.* (TNM); Huoyenshan, 24 Nov 1988, *Hsieh 3505* (TAI). TAICHUNG HSIEN: Anmashan, Tahsuehshan logging station, 9 Oct 1957, *Liu 19* (TAI); Chingshan, 25 Oct 1984, *Lu 13259* (TAIF); Pahsienshan logging trail, elev. 1,400 m, 28 Oct 1983, *Lu 13300* (TNM, TAIF). NANTOU

HSIEN: Juiyenshan Nature Reserve Area, elev. 2,150 m, 29 Dec 1993, *Wang 597* (TNM); Lienhuachih, 1 Nov 1979, *Li s. n.* (TCF); Lienhuachih, 28 Dec 1996, *Lai s. n.* (TCF); Minchien Hsiang, Sungpoling, 16 Jan 2001, *Tsou 1480, 1481, 1482, 1483* (all at HAST). KAOHSIUNG HSIEN: Maolin Hsiang, Shanping, along the trail to Nanfengshan, elev. ca. 750 m, 7 Nov 1991, *Wang 832* (HAST). PINGTUNG HSIEN: Chashan, elev. 400-600 m, 11 Dec 1996, *Tseng 19* (TNM); Kenting National Park, on the way from Nanjenshan Station to Nanjenhu, elev. ca. 350 m, 8 Dec 1995, *Liu 274* (HAST); Litingshan, elev. 470-550 m, 26 Dec 1996, *Chen 3* (HAST); Litingshan, elev. 300-700 m, 23 Dec 1999, *Yang 28453* (PPI, TNM); Manchou Hsiang, Laofoshan, elev. 350-500 m, 30 Dec 1999, *Wang 4057* (TNM); Mutan Hsiang, Kaoshih Tsun, along a mountain trail, elev. ca. 320 m, 7 Dec 1995, *Liu 182* (HAST, TNM); Mutan Hsiang, on the way from Kaoshih Tsun to Shihmin, 7 Dec 1995, *Liu 204* (HAST, TNM); Shantimen, 15 Dec 1996, *Chen 4* (TNM); Wanluan Hsiang, Wanchin, elev. ca. 150 m, 7 Dec 1986, *Peng 10173* (HAST); Wuweishan, Laiyi logging trail, 7 k, elev. ca. 650 m, 2 Dec 1995, *Yang 4600* (HAST, PPI, TAIF, TNM), 23 Dec 1999, *Yang 28732* (PPI, TAIF), 26 Dec 1998, *Yang 28087* (HAST, PPI). TAITUNG HSIEN: Chiulili, elev. 1,200 m, 3 Dec 2000, *Chen 1796* (TAIF).

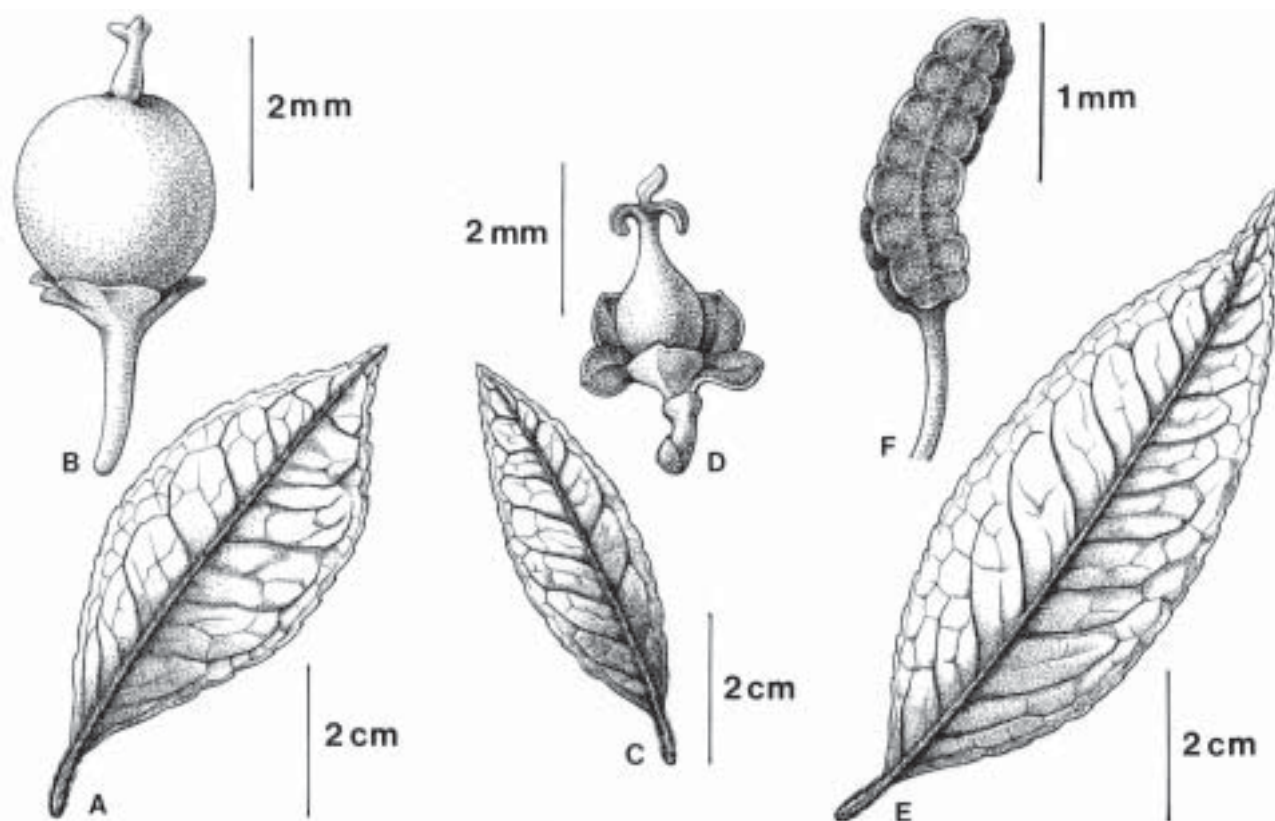


Figure 2. *Eurya septata*. A, Leaf; B, Mature fruit; C, Leaf; D, Young fruit; E, Leaf; F, Septate anther. (A, B, from *T.Y. Yang 6471*; C, D, from *C.H. Tsou 1472*; E, F, from *C.S. Wu 8911*)

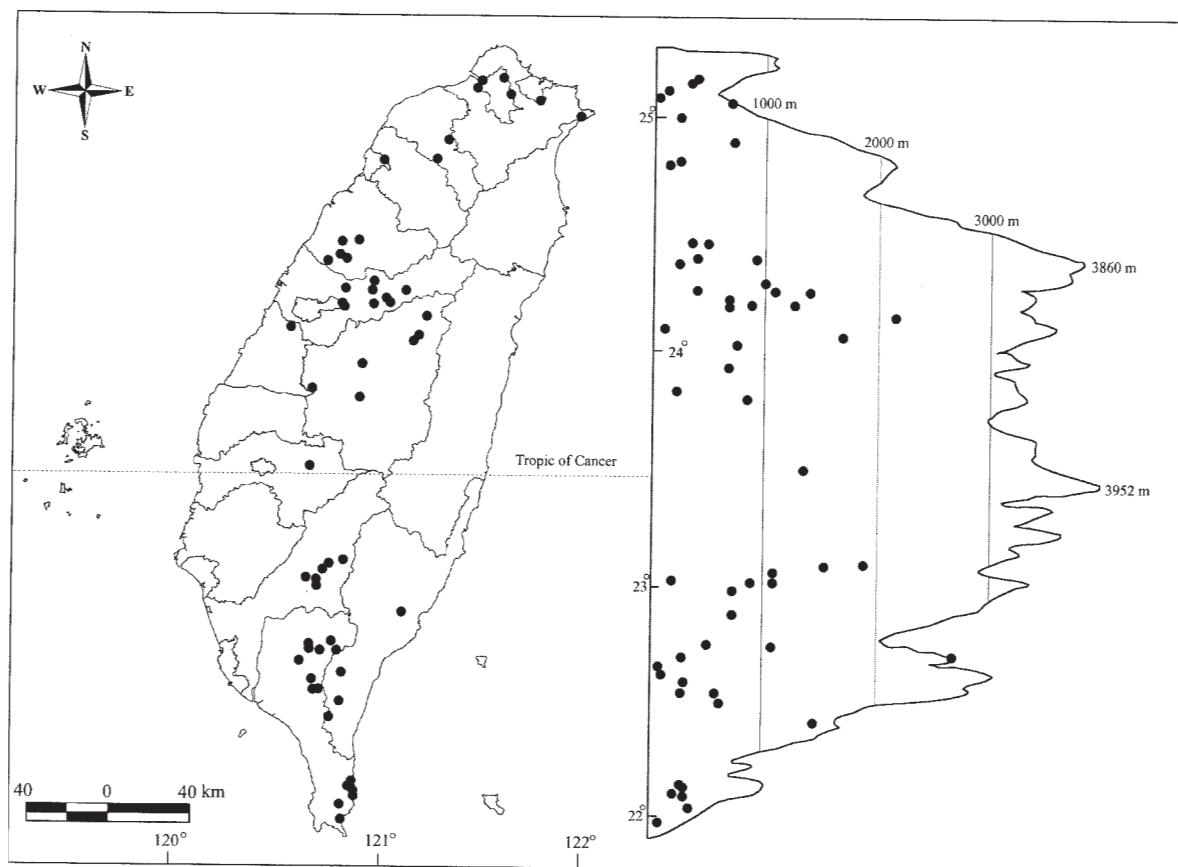


Figure 3. Distribution map of *Eurya septata* in Taiwan.

Specimens with female flowers or fruits. TAIPEI HSIEN: Kuanyin Hsiang, Kuanyinshan, 28 Dec 2000, *Tsou 1472* (HAST); Tsaolingkutao, 12 Jun 1999, *Ho 1030* (TAIF). TAOYUAN HSIEN: Tahsi, Chinmienshan, elev. 300-667 m, 22 Oct 1996, *Yang 5029* (HAST, PPI). HSINCHU HSIEN: Kuanhsi Chen, elev. 200-300 m, 26 Jun 1996, *Wang 4648* (TNM). TAOYUAN HSIEN: Kuanhsi to Fuhshing, elev. 500 m, 1 Jun 1992, *Huang 4813* (TAI). MIAOLI HSIEN: Kuantaoshan, 11 Dec 1977, *Chang s. n.* (TCF); Kuantaoshan, 30 Apr 1983, *Ou s. n.* (TNM); Kuantaoshan, elev. 400-500 m, 14 Jan 1992, *Huang 15456* (TAI). TAICHUNG CITY: Takengshan, along hiking trail, elev. 665-735 m, 29 Sep 1994, *Wang 258* (HAST). TAICHUNG HSIEN: Chingshan, 6 Apr 1984, *Huang 626* (TAI); Huoyenshan, 7 Mar 1986, *Ou 9179* (TCF); Kukuan, 25 Dec 1976, *Sung s. n.* (TCF); Lishan, 23 Jan 1977, *Kuo 7567* (TAI); Takeng, 20 Apr 1989, *Ou s. n.* (TNM); Techishuiku, 23 Jan 1977, *Kuo 7538* (TAI); Toukeshan, elev. 300-500 m, 12 Apr 1999, *Ho 966* (TAIF). NANTOU HSIEN: Chingshuikou, 14 Feb 1959, *Huang 728* (HAST, TAI); Jenai Hsiang, Yushih, elev. 1,740 m, 21 Nov 1997, *Yang 9727* (PPI, TNM); Lienhuachih, *Hsieh 1036* (TCF); Minchien Hsiang, 26 Dec 1985, *Wu 8912* (TCF); Pihu, elev. 1,100 m, 24 Jun 1997, *Yang 8327* (PPI, TNM); Sungpoling, 16 Jan 2001, *Tsou 1476, 1479* (both at HAST). KAOHSIUNG HSIEN: Maolin Hsiang, Shanping, along the trail to Nanfengshan, elev. ca. 750 m, 7 Nov 1991, *Wang 827* (HAST). PINGTUNG HSIEN: Laiyi Hsiang, Laiyi to

Laiyi Farm, 9 Jul 1993, *Wang 8424* (HAST); Litingshan, elev. 450-650 m, 23 Dec 1999, *Yang 28634* (PPI, TAIF); Litingshan, elev. 400-350 m, 25 Jul 2000, *Yang 29856* (PPI, TAIF); National Pingtung University of Science and Technology, 3 Mar 1989, *Yang 9553* (PPI, HAST); Tawu Hsiang, Tawu logging track, elev. ca. 1,200 m, 3 Apr 1996, *Yang 6471* (HAST, PPI, TNM); Wutai Hsiang, Ali, 13 Feb 1979, *Kuo 10509* (TAI); Wutai Hsiang, Ali, 17 July 1989, *Yang 10113* (PPI, HAST). TAITUNG HSIEN: Shouka to Shusuiboo, 9 Aug 1955, *Liu & Keng 2844* (TAI); Tawu, elev. 850 m, 27 Sep 1979, *Lu s. n.* (TAIF).

Habitat, distribution (Figure 3), and phenology. *Eurya septata* occurs in secondary forests and in disturbed areas, for example along roadsides, or sometimes in association with bamboos. It is found throughout western Taiwan from lowlands to mid elevations. Flowering occurs from October to January, but peaks in November and December; fruits usually mature in May and June.

Relationships. *Eurya septata* is similar to *Eurya chinensis* in gross morphology. These two species can be separated from the remaining species of *Eurya* in Taiwan by the combination of: terminal buds densely covered with appressed, hairs 400-600 μm long; branchlets slightly ridged and covered with dark, 400-600 μm long hairs; leaves elliptic or elliptic-obovate, mostly 4-7 cm long, with short petiole; ovary and fruits glabrous. Our ITS sequencing data (unpublished) also support that this new species

is closest to *E. chinensis*. On the other hand, the differences between *Eurya septata* and *E. chinensis* are well defined. *Eurya septata* has septate anthers with each anther lobe possessing 3-6 septa, pedicels 0.5-1.5 mm long, 3-6 flowers per fascicle, and sepals sometimes with very short hairs on the abaxial surface. In contrast, *E. chinensis* has nonseptate anthers, pedicels 2-4 mm long, 1-3 flowers per fascicle, and sepals with a glabrous abaxial surface.

Acknowledgements. We thank the curators of the following herbaria for allowing us to study their collections of *Eurya*: HAST, TAI, TCF, TNM, and PPI and TI for sending the loans of *E. japonica*. We are grateful to Dr. Scott Mori for reviewing this manuscript, to Dr. Yuen-Po Yang for the valuable discussion, to Dr. Sheng-Zen Yang, Ms. Chiu-Mei Wang, and Mr. Chih-Sheng Wu for providing the materials, to Ms. Jane Chen for preparing the illustrations, to Ms. Patricia Eckel for reviewing the Latin description, and to Ms. Yu-Lan Fu and Ms. Tsui-Ya Liu for providing assistance in various ways during the course of this study. This study was supported by the National Science Council, Republic of China under the project NSC 88-2311-B-001-037.

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台灣柃木屬植物之研究 (1)： 特有新種 “台灣格柃” 之報導

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本文描述厚皮香科的一個新種—台灣格柃 (*Eurya septata*)，係分布於台灣的一特有種。本種與常見於台灣及大陸華南的米碎柃木 (*Eurya chinensis*) 最為近似，唯前者之花藥有藥隔，花梗較短，且一花序中花數較多。

關鍵詞：花藥分隔；柃木；米碎柃木；台灣格柃；台灣；分類學；厚皮香科。