

Research note

Confirmation of the Existence of *Eurya japonica* Thunb. (Pentaphylacaceae) in Taiwan

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【 Summary 】

The existence of *Eurya japonica* Thunb. (Pentaphylacaceae) in Taiwan has been controversial in the past few decades. This taxon was first mentioned in Taiwan by Henry in 1896. Thereafter, most studies agreed with Henry's opinion. However, this species was excluded from the *Flora of Taiwan*, 2nd ed. In examining available specimens cited as *E. japonica* in former publications, we found that all of them should be other species, which is congruent with the view of the Flora of Taiwan. Nevertheless, when the corresponding author was conducting a field survey on Gueishan Island in 2003, an unknown *Eurya* species characterized by glabrous buds, branchlets, and leaves was collected. By a careful review of the literature and specimens, this taxon was determined to be *E. japonica*. Therefore, the distribution of *E. japonica* in Taiwan was confirmed. In this article, we describe *E. japonica* according to our new finding. A line drawing and photos are also provided to help identify this plant.

Key words: *Eurya japonica* Thunb., Flora of Taiwan, Pentaphylacaceae.

Liao CC, Su MH. 2015. Confirmation of the existence of *Eurya japonica* Thunb. (Pentaphylacaceae) in Taiwan. *Taiwan J For Sci* 30(2):139-46.

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Received April 2015, Accepted May 2015. 2015年4月送審 2015年5月通過。

研究簡報

確認日本柃木(五列木科)存在於台灣

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摘 要

日本柃木(五列木科)是否分布於台灣一直是有爭議的。本種在台灣的分佈最早由Henry在1896年提出。之後，大多數相關研究都同意Henry的觀點。然而，台灣植物誌第二版卻將本種排除於台灣。我們檢視了在標本館中曾被過往文獻引證為日本柃木的標本，發現這些標本都是別種的柃木屬植物。因此，我們認同台灣植物誌第二版的見解。雖然如此，在2003年時，本文通訊作者在龜山島採集到一種特徵為全株光滑無毛的柃木。經過審慎的文獻與標本查證之後，確認其就是日本柃木。因此，台灣確定有日本柃木的分佈。本文針對本種的特徵進行描述，同時提供手繪圖與照片，作為協助鑑定之用。

關鍵詞：日本柃木、台灣植物誌、五列木科。

廖啟政、蘇夢淮。2015。確認日本柃木(五列木科)存在於台灣。台灣林業科學30(2):139-46。

The genus *Eurya* Thunb. (Pentaphylacaceae) comprises about 130 species in tropical and subtropical Asia and Pacific islands (Hsieh et al. 1996). In Taiwan, there were 9 (Yamamoto and Mori 1934), 11 (Keng 1950, Li 1976), or 12 (Ying 1995, Hsieh et al. 1996) species recognized in different studies, which shows that controversy exists to the taxonomy of *Eurya* in Taiwan.

The existence of *E. japonica* Thunb. in Taiwan is one of those controversial issues. *Eurya japonica* was first published by Thunberg (1783) based on Kaempfer's description (1712), when Thunberg established the genus *Eurya*. In Taiwan, *E. japonica* was first mentioned by Henry (1896). In that publication, Henry only cited specimens but no description was given. Because of the various morphologies presented, Henry (1896) expressed doubt that there might be more than 1 species in his collections.

Thereafter, most taxonomic reports concerning the genus *Eurya* also agreed with the distribution of *E. japonica* in Taiwan

(Matsumura and Hayata 1906, Hayata 1908, Yamamoto and Mori 1934, Kanehira 1936, Kobuski 1938, Keng 1950, Liu and Lu 1967, Li 1976, Ying 1995). However, Hatusima (1975) and Walker (1976) doubted the existence of *E. japonica* in Taiwan. Moreover, Hsieh et al. (1996) excluded Taiwan from the distribution of *E. japonica* and thought that name was a misidentification of *E. nitida* Korth.

The key morphological trait of *E. japonica* is that the entire plant is glabrous (Thunberg 1783, 1784, Kobuski 1938). In Taiwan, there are 5 other species, i.e. *E. glaberrima* Hayata, *E. hayatai* Yamam., *E. nanjenshanensis* (C.F.Hsieh, L.K.Ling & Sheng Z.Yang) Sheng Z.Yang & S.Y.Lu, *E. nitida* and *E. renegechiensis* Yamam., which possess such a trait (Kobuski 1938, Hsieh et al. 1996, Yang et al. 1997). However, based on the related literature and specimens from the herbaria of University of the Ryukyus (RYU), National Taiwan University (TAI), and Taiwan Forestry Research Institute (TAIF), *E. japonica*

could be readily distinguished from the others by the leaf morphology (Table 1).

On reviewing available specimens cited as *E. japonica* in Hayata (1908), Keng (1950), and Li (1976), we found that all of them should be other species (Table 2). At that point, it seemed that *E. japonica* should be

excluded from Taiwan, which thus agreed with the treatment in Hsieh et al. (1996).

Gueishan Island is a small island located in the Pacific Ocean about 9 km east of the northeastern corner of the main island of Taiwan. In 2003, when the corresponding author was conducting a field survey on Gueishan

Table 1. Comparison of the leaf morphology of *Eurya japonica* and similar species

Species	Traits	Margin	Apex	Secondary veins on abaxial surface
<i>E. japonica</i>		sparsely undulate-serrate	acuminate or acute	predominant
<i>E. glaberrima</i>		sharply serrulate	acute	predominant
<i>E. nitida</i>		closely serrulate	acuminate or acute	predominant
<i>E. rengichiensis</i>		minutely serrulate	cuspidate-acuminate	predominant
<i>E. hayatai</i>		subentire or slightly crenate	obtuse	obscure
<i>E. nanjenshanensis</i>		subentire or slightly crenate	obtuse or retuse	obscure

Table 2. Determination of available specimens cited as *Eurya japonica* in Hayata (1908), Keng (1950), and Li (1976)

Literature	Specimen cited	Herbarium	Name determined
Hayata 1908	<i>T. Kawakami & U. Mori 1788</i>	TAIF	<i>E. leptophylla</i>
	<i>T. Kawakami & U. Mori 1866</i>	TAIF	<i>E. loquiana</i>
	<i>T. Kawakami & U. Mori 2121</i>	TAIF	<i>E. glaberrima</i>
Keng 1950	<i>Lin 3238</i>	TAI	<i>E. chinensis</i>
	<i>Masamum 2806</i>	TAI	<i>E. chinensis</i>
	<i>Masamune 352</i>	TAI	<i>E. chinensis</i>
	<i>Mori 3239, 3240, 3241</i>	TAI	<i>E. chinensis</i>
	<i>Nakamura 4057</i>	TAI	<i>E. nitida</i>
	<i>Onodera 3243</i>	TAI	<i>E. chinensis</i>
	<i>Sasaki 3236</i>	TAI	<i>E. chinensis</i>
	<i>Sashioka 3245</i>	TAI	<i>E. chinensis</i>
	<i>Shimizu 3237</i>	TAI	<i>E. chinensis</i>
	<i>Suzuki 2612</i>	TAI	<i>E. chinensis</i>
	<i>Suzuki 15521</i>	TAI	<i>E. nitida</i>
Li 1976	<i>Suzuki 16435</i>	TAI	<i>E. chinensis</i>
	<i>Yamamoto & Mori 3242</i>	TAI	<i>E. chinensis</i>
	<i>Masamune & Suzuki s. n.</i>	TAI	<i>E. emarginata</i>
	<i>Nakamura 4057</i>	TAI	<i>E. nitida</i>
	<i>Liu et al. 355, 479</i>	TAI, PH	<i>E. hayatae</i>
	<i>Owatari s. n.</i>	TAI	<i>Adinandra formosana</i>
	<i>Liu & Keng 498</i>	TAI, PH	<i>E. emarginata</i>
<i>Chuang & Hsu 2333</i>	TAI, PH	<i>E. emarginata</i>	

Island, an unknown *Eurya* plant characterized by glabrous buds, branchlets, and leaves was collected. By a careful review of the literature (Thunberg 1783, 1784, Kobuski 1938, Ohwi 1965, Hatusima 1975) and specimens from RYU, TAI, TAIF and the herbarium of Institute of Botany, Chinese Academy of Sciences (PE; image only), this plant was determined to be *E. japonica*. Therefore, the distribution of *E. japonica* in Taiwan was confirmed. Based on available specimens, Gueishan Island seems to be the only habitat of *E. japonica* in Taiwan, where previous reports had never documented it (Henry 1896, Hayata 1908, Yamamoto and Mori 1934, Kanehira 1936, Kobuski 1938, Keng 1950, Liu and Lu 1967, Li 1976, Ying 1995).

In this paper, we describe *E. japonica* according to our new finding. A line drawing and photos are also provided to help identify this plant. A key to distinguish this taxon and similar species (characterized by fully glabrous bodies) in Taiwan is provided.

Key to *Eurya japonica* and similar species in Taiwan

- 1a. Secondary veins on abaxial surfaces of leaves obscure 2
 2a. Leaves elliptic to elliptic-obovate, up to 10 cm long *E. hayatai*
 2b. Leaves orbicular-obovate to oblong-obovate, up to 5 cm long
 *E. nanjenshanensis*
 1b. Secondary veins on abaxial surfaces of leaves predominant 3
 3a. Leaf margins sparsely undulate-serrate, gradually entire toward base
 *E. japonica*
 3b. Leaf margins full with fine serrations 4
 4a. Leaves > 3 cm broad, apex cuspidate-acuminate *E. renegechiensis*
 4b. Leaves < 3 cm broad, apex acuminate to acute 5

- 5a. Leaves hard-coriaceous, margins sharply serrulate; distributed above 1500 m in elevation, throughout the Central Mountain Range
 *E. glaberrima*
 5b. Leaves coriaceous, margins closely serrulate; distributed below 700 m in elevation, confined to northern regions
 *E. nitida*

Taxonomic treatment

Eurya japonica Thunb., Nov. Gen. Pl. 3: 67. 1783; Fl. Jpn. 191, t. 25. 1784; Kobuski, Ann. MO. Bot. Gard. 25: 335. 1938; Ohwi, Fl. Jpn. 630. 1965; Walker, Fl. Okinawa S. Ryukyu 732, 1976; Nagamasu, Fl. Jpn. 2a: 410. 2006; Ming & Bartholomew, Fl. China 12: 467. 2007. Figs. 1, 2

A small evergreen tree or shrub, dioecious; branchlets glabrous. Leaves simple, alternate, glabrous; blade coriaceous, elliptic, oblong-oblongate, or elliptic-lanceolate, (3) 3.5~5 (6) cm long, (1.2) 1.5~2.5 (3) cm broad, apex acute or acuminate, sometimes with blunt tip, base attenuate, margins sparsely undulate-serrate, gradually entire toward base, slightly revolute; secondary veins 5~8 pairs, not extending to margins, looped; petioles sulcate, glabrous, 2~5 mm long. Flowers axillary, 1~3-clustered, glabrous; pedicels 1~2 mm long, bracteoles 2, attached at apex of pedicels. Staminate flowers: campanulate; sepals 5, imbricate, rounded, 1.5~2.5 mm long; petals 5, imbricate, base connate, less spread, pale-yellow, sometimes turning purple toward apex, rounded to broad obovate, 2~3 mm long, apex mucronate, rounded, or slightly emarginate, sometimes revolute; stamens (7) 9~12 (15), anthers oblong, valvate, not septate, ca. 1 mm long, filaments ca. 0.5 mm long. Pistillate flowers: rotate; sepals and pet-



Fig. 1. *Eurya japonica* Thunb. **A**, Fruiting branch; **B**, staminate flower; **C**, pistillate flower; **D**, anthers.

als similar to those of staminate flowers; petals pale-yellow; ovaries ovate, glabrous, 2~2.5 mm long; styles 3-fid, 1 mm long, recurved, persistent. Berries black, globose, 5 mm across. Seeds irregularly shaped, ca. 1 mm across, coats reticulate. Flowering January to March. Fruiting May to July.

Korea, Japan (including the Ryukyu Islands) and E. China. Taiwan, around the mountain ridge of Gueishan Island (200~400 m in elev.).

Note: *Eurya japonica* was usually reported as a dioecious plant (Thunberg 1783, Kobuski 1938, Ohwi 1965). However, Nagamasu (2006) described that some of the *E. japonica* from Japan had bisexual flowers. Nevertheless, the bisexual trait was not observed in the population from Taiwan. In our

field investigation, 2 species in *Eurya* were recorded on Gueishan Island. *Eurya japonica* was distributed around the mountain ridge, while *E. emarginata* Makino was near the coast. In places between the mountain ridge and coast, plants which were morphologically close to *E. japonica* but with hairs on young shoots were collected (e.g., *M.H.Su* 192, 703, 714 & 715 in TAIF). They probably originated from hybridization of the 2 species. However, further study is necessary to confirm the hybridization.

Specimens examined: JAPAN. Chibaken Pref., Kiyosumiya, 7 Nov. 1967, *S.Tamaki s. n.* (RYU). Fukui Pref., Tsurugashi, elev. ca. 100 m, 14 Sept. 1982, *H.Ohashi et al.* 8781 (RYU). Fukuoka Pref., Fukuokashi, elev. ca. 20 m, 20 May 1972, *T.Amakawa*

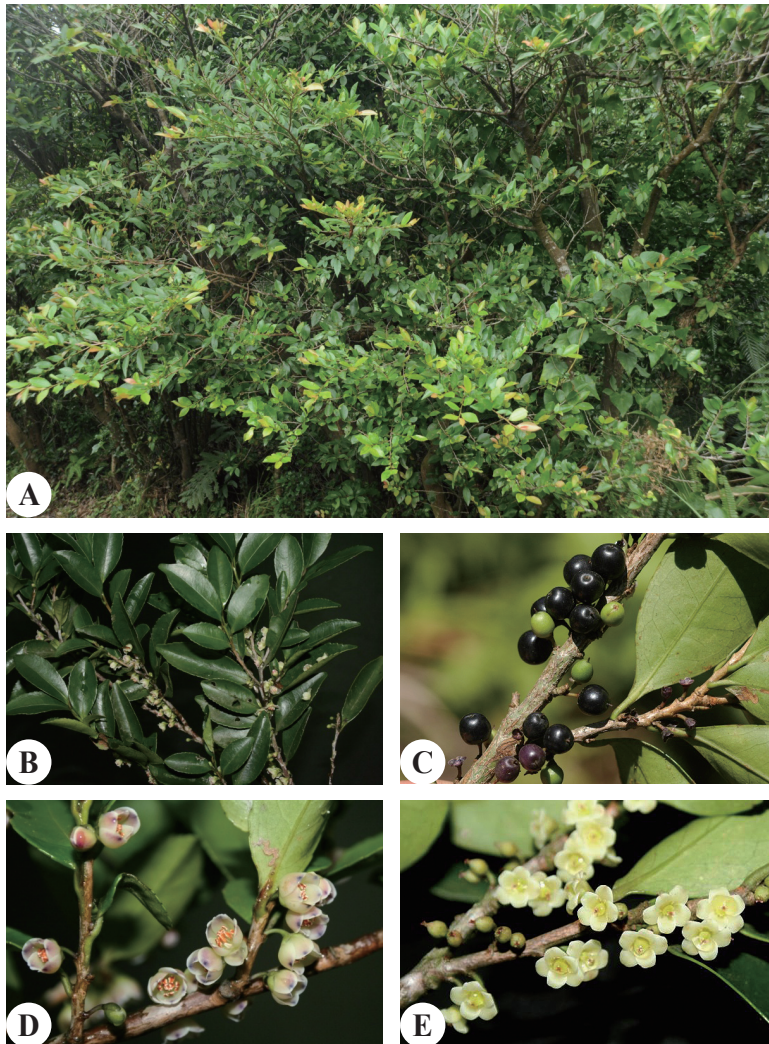


Fig. 2. Photos of *Eurya japonica* Thunb. **A**, Habit; **B**, flowering branches; **C**, fruits; **D**, staminate flowers; **E**, pistillate flowers. **A & B**, photo by Pi-Fong Lu.

2396 (RYU). Hiroshima Pref., Hiroshima-shi, 9 Apr. 1961, *Y.Niuro 10028* (RYU). Honshu Pref., Shizuoka, elev. ca. 5 m, 25 Mar. 2004, *F.Konta 23763* (PE). Hyogo Pref., Kawabegun, 8 Apr. 1975, *M.Furuse 8331* (PE). Ishikawa Pref., Kanazawa-shi, 3 May 1962, *M.Odachi s. n.* (RYU); *ibid.*, 30 Apr. 1984, *H.Furuike s. n.* (RYU). Kagoshima Pref., Bonotsu, 9 Mar. 1975, *M.Furuse 8100* (RYU); Kagoshima-shi, 25 Oct. 1970, *M.Furuse 135* (RYU); *ibid.* 17 Mar. 1975, *M.Furuse*

7974 (RYU); Mt. Inao-dake, 13 Apr. 1976, *M.Furuse 10688* (RYU); Mt. Noma-dake, 8 Apr. 1975, *M.Furuse 8331* (RYU); Tashirocho, 11 Apr. 1975, *M.Furuse 8387* (RYU); Tokunoshima, Mt. Intabu-dake, 14 Feb. 1975, *Y.Miyagi & S.Hatusima 39742* (RYU); Yakushima-cho, 28 Aug. 1968, *Y.Miyagi 3545* (RYU); *ibid.*, 14 Mar. 1974, *Y.Miyagi 4048* (RYU); Yuwan, Mt. Yuwan-dake, elev. ca. 400 m, 27 Mar. 1965, *S.Sako 5273* (RYU). Kanagawa Pref., Sagami-hara-shi, elev.

ca. 220~250 m, 22 Mar. 2008, *T.Miyazaki 803135* (PE). Kochi Pref., Shimanto-shi, elev. ca. 380~390 m, 15 May 2007, *K.Yonekura 14404* (PE). Kyoto Pref., Kamo-gun, 1 Apr. 1952, *C.Hashimoto 845* (PE); North of Kyoto-shi, elev. ca. 250 m, 6 Apr. 2003, *T.Fukuda s. n.* (TI). Mieken Pref., Owase-shi, 26 Mar. 1965, *H.Ohba 1095* (RYU). Nagasaki Pref., Shimogata-gun, 5 Oct. 1967, *M.Furuse 45910* (PE). Okinawa Pref., Amami Oshima, 12 Mar. 1924, *Z.Tashiro s. n.* (TAIF); Haga-yama, 1 Apr. 1907, *T.Kawakami & G.Nakahara s. n.* (TAIF); Kunigami-gun, 28 Jan. 1924, *Z.Tashiro s. n.* (TAIF); *ibid.*, Mt. Nishime, elev. 369 m, 4 Dec. 2013, *C.F.Chen 5023* (TAIF); *ibid.*, Hiji, 5 Dec. 2013, *C.F.Chen 5095* (TAIF); Okierabu, 10~13 Dec. 1974, *Y.Miyagi & S.Hatusima 39114* (RYU); Yonaguni, 1 Oct. 1917, *Y.Shimada s. n.* (TAIF). Shiga Pref., Near Echigawa, Omi, 9 Apr. 1902, *T.M. s. n.* (TAIF); Shizuoka Pref., Kamo-gun, 25 Oct. 1971, *M.Furuse 51048* (PE, RYU). Tochigi Pref., Shimotsuga-gun, 29 Mar. 1983, *M.Furuse 51529* (PE). Tokyo Pref., Higashiyama, elev. ca. 600 m, 3 May 1979, *K.Inoue 1027* (RYU); Koto, Mt. Kiyosumi, 30 Oct. 1957, *N.Maruyama & K.Okamoto 1618* (PE); Tokyo, 1 May 1910, *T.M. s. n.* (TAIF). Yamaguchi Pref., Yamaguchi-shi, 26 Mar. 1956, *S.Miyake s. n.* (RYU); *ibid.*, 22 Apr. 1976, *K.Oka 38742* (RYU). Yehime Pref., Niihama-shi, 6 Oct. 1969, *M.Furuse 48308* (PE).

KOREA. Jeju Prov., Namjeju-gun, elev. ca. 100~390 m, 22 Jul. 1992, *D.E.Boufford et al. 25734* (PE). South Jeolla Prov., Haenam-gun, 27 Sept. 2003, *C.Chang & G.Cheon 1374* (PE); *ibid.*, elev. ca. 194 m, 21 Mar. 2009, *K.Kim et al. 94* (PE); Sinan-gun, elev. ca. 89 m, 4 Apr. 2009, *K.Kim et al. 225* (PE).

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(TAIF); *ibid.*, 14 Feb. 2011, *M.H.Su 707, 708, 710, 711, 712, 718, 719, 721* (TAIF); *ibid.*, 1 Mar. 2014, *W.Y.Wang 1887, 1888* (TAIF).

ACKNOWLEDGEMENTS

We are grateful to Ms. Su-Ching Chang for her line drawing and Ms. Pi-Fong Lu for the photos. This study was supported by a grant (103AS-13.8.1-FB-e5) from the Forestry Bureau, Taiwan.

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