

臺灣衛矛科深裂衛矛組的新紀錄種— 百齒衛矛

Euonymus centidens H. Lév. (Celastraceae: sect. *Melanocarya*): a Newly Recorded Species in Taiwan

陳柏豪¹ 黃俊溢² 鍾安晴³ 王志強⁴ 楊勝任^{4*}

Po-Hao Chen¹, Juinn-Yih Huang², An-Ching Chung³, Chih-Chiang Wang⁴,
and Sheng-Zehn Yang^{4*}

¹ 國立屏東科技大學農學院生物資源博士班 91201 屏東縣內埔鄉學府路 1 號

² 獨立研究者

³ 行政院農業委員會林業試驗所六龜研究中心 844005 高雄市六龜區中庄 198 號

⁴ 國立屏東科技大學森林系 91201 屏東縣內埔鄉學府路 1 號

* 通訊作者 e-mail: yangsz@mail.npust.edu.tw

¹ Graduate Institute of Bioresources, National Pingtung University of Science and Technology, Neipu Township, Pingtung, Taiwan

² Independent researcher

³ Liouguei Research Center, Taiwan Forest Research Institute, Liouguei District, Kaohsiung, Taiwan

⁴ Department of Forestry, National Pingtung University of Science and Technology, Neipu Township, Pingtung, Taiwan

*Corresponding author e-mail: yangsz@mail.npust.edu.tw

Abstract

We report the first record of *Euonymus centidens* H. Lév. of the sect. *Melanocarya* (Celastraceae) in Taiwan. Three populations were found in mountainous areas at 500–600 m altitude in northern Taiwan, which thus represent the easternmost distribution of *E. centidens* in the world. The morphology of *E. centidens* is similar to that of a different species within the same genus, *E. tashiroi* Maxim. The most distinguishable characteristic between them is that the leaf margin is serrulate in *E. centidens* and is only slightly and obtusely serrate in *E. tashiroi*. A taxonomic description, color photographs, and line drawings of *E. centidens* are provided here to facilitate identification. It is needed to reveal further insights regarding the distribution and history of this Taiwan new record species.

Key words: Celastraceae, *Euonymus centidens*, newly recorded species, sect. *Melanocarya*, Taiwan

摘要

本文報導臺灣衛矛科深裂衛矛組 (sect. *Melanocarya*) 的新紀錄種—百齒衛矛 (*Euonymus centidens* H. Lév.)。此新紀錄種三個族群分布於臺灣北部海拔 300–600 m 山區，為本種於世界分布最東界。它的形態特徵近似於同屬之菱葉衛矛 (*E. tashiroi* Maxim.)，最大之差異為本種葉緣具細鋸齒，可明顯與菱葉衛矛之疏鋸齒區別。本文提供百齒衛矛的特徵描述、彩色照片和線繪圖以供鑑定參考。未來有必要探討此臺灣新紀錄種的分布和歷史。

關鍵詞：衛矛科、百齒衛矛、新紀錄種、深裂衛矛組、臺灣

Introduction

The genus *Euonymus* L. (Celastraceae) comprises approximately 130 species, of which about 115 species are distributed in Asia. This genus also occurs in Europe and North America, and ten species were reported in Taiwan (Lu and Yang 1993; Ma and Funston 2008). The Celastraceae can be divided into six sections, i.e., sect. *Echinococcus*, sect. *Euonymus*, sect. *Glyptopetalum*, sect. *Ilicifolia*, sect. *Kalonymus*, and sect. *Melanocarya* (Liu *et al.* 2021). Mostly native to East Asia, the eleven species of sect. *Melanocarya* are shrubs or small trees, which are mostly deciduous, and a few are evergreen. Leaves are opposite, flowers are 4-merous, petals are light yellow-green, capsules are 4-lobed, and seeds are covered by arils over half of the surface (Ma 2001; Liu *et al.* 2021). However, Zhang *et al.* (2012) suggested that the fleshy part of the Celastraceae seeds does not originate from the funiculus or the hilum, but from the exostomat-

ic micropyle, thus the fleshy structure should not be referred to as “aril” but as “caruncula”. Therefore, we use the term caruncula to refer to the fleshy structure covering the Celastraceae seeds reported here.

Only one species of sect. *Melanocarya* was previously reported to occur in Taiwan, i.e., *Euonymus tashiroi* Maxim. However, recently, a different species of sect. *Melanocarya* was found in a low-altitude mountainous area in northern Taiwan. This species was thoroughly examined, and a literature search was conducted, after which we were able to confirm that this species was *Euonymus centidens* H. Lév. (Ma and Funston 2008), which was previously considered endemic to China. Thus, we here present the first record of this species in Taiwan, which therefore represents the easternmost distribution area of *E. centidens* in the world. A taxonomic description, color photographs, and line drawings of this species are provided here to facilitate

identification.

Taxonomic treatment

Euonymus centidens H. Lévl. Repert.

Spec. Nov. Regni Veg. 13: 262. 1914.

百齒衛矛 (Fig. 1, 2)

Type: CHINA. Yunnan, Long-Ky, E. E. Maire *s.n.* (isotype E, photograph seen, Fig. 3).

Synonyms (Ma 2001):

E. euscaphioides F.H. Chen & M.C. Wang, Acta Phytotax. Sin. 3(2): 235, f. 2: 1-2. 1954. TYPE: CHINA. Jiangsi: Lushan, Wurushi, June 6, 1951, *M.C. Wang 710* (LBG, PE).

E. euscaphioides F.H. Chen & M.C. Wang var. *serrulata* F.H. Chen & M.C. Wang, Acta Phytotax. Sin. 3(2): 236. 1954. TYPE: CHINA. Jiangsi: Yifeng, Huanggangshan, Oct. 15, 1947, *Y.K. Hsiung 6397* (A, LBG).

E. streptoptera Merr., Sunyatsenia 1: 198. 1938. TYPE: CHINA. Kwangtung: Lokchong, May 14 and 17, 1929, *C.L. Tso 20487* (MO).

Morphological description: Evergreen

shrub or small tree, branchlets and twigs 4-winged at the juvenile stage, converting to 4-angled at the woody stage. Leaves opposite, obovate to elliptic, 4.3–9.8 cm long, 3–4 cm wide, thick-papery to thin-leathery, base cuneate, margins serrulate, each side with approximately 30–50 teeth, apex acute to acuminate, both surfaces glabrous, lateral veins in 4–5 pairs, the apex of lateral veins curving inward and forming loops; petiole 2–3 mm or sessile; stipule triangular, ca. 1 mm long, persistent. Flowers axillary, solitary, 2-clustered, or in cymes, peduncle 1.7–2.4 cm long; calyx 4-lobed, each lobe 1.5 × 1 mm; petals 4, light-green to yellowish, suborbicular, 2–2.5 × 2.1–2.5 mm; disc ca. 1.5 mm in diameter; pedicel 3–5 mm long. Capsules ca. 1.5 cm in diameter, green at maturity, dehiscent into 4 lobes, sometimes only 2–3 lobes developed, each lobe ovoid, sepals persistent; seeds red, with orange caruncula.

Specimens examined: TAIWAN. New Taipei City: Pingxi District, Niazui-

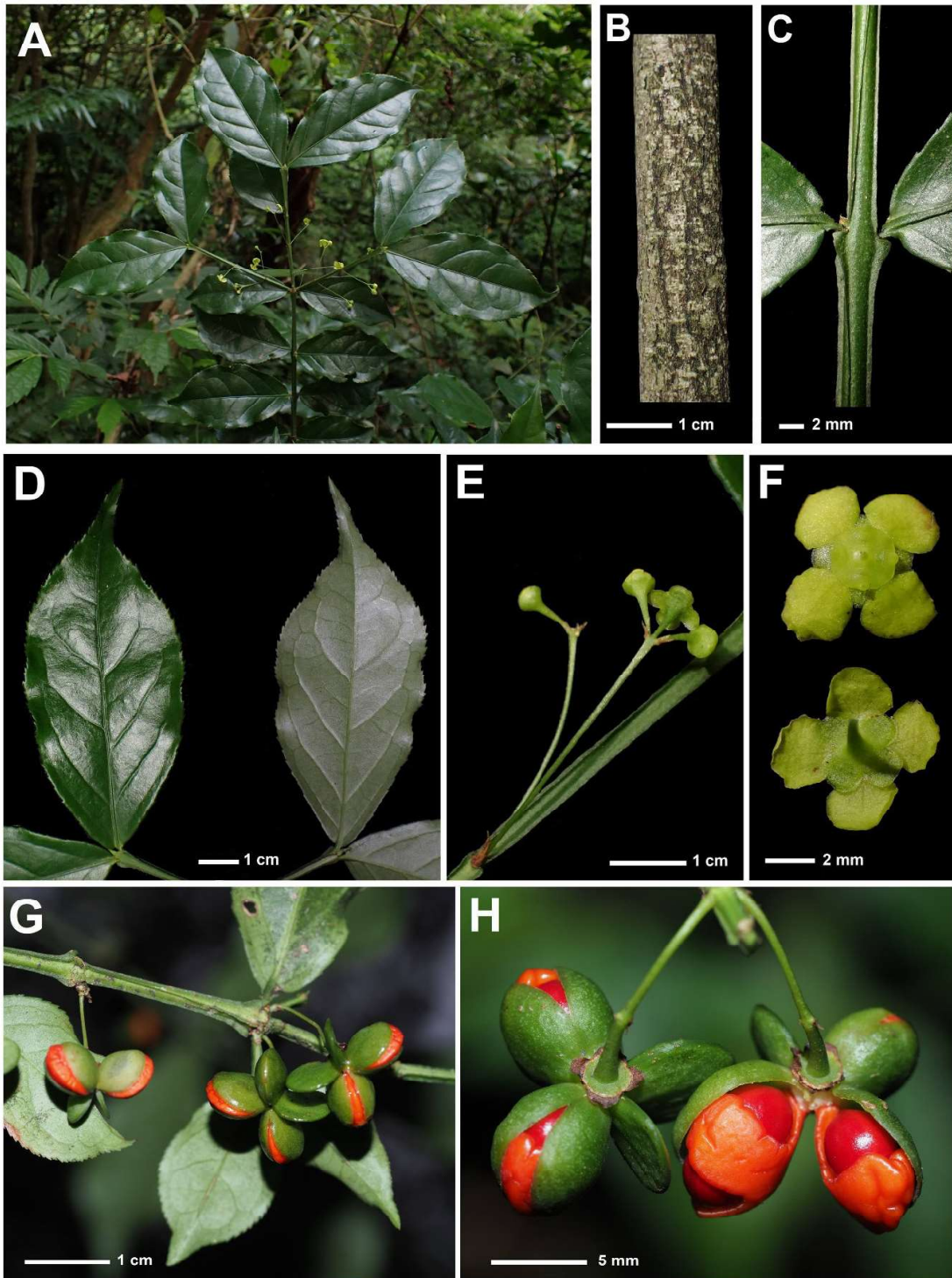


Fig. 1. *Euonymus centidens* H. Lévl. A, habit; B, trunk; C, branchlet and twig 4-angled at the juvenile stages; D, leaves, adaxial (left) and abaxial (right) surface; E, cymes; F, flowers, adaxial (upper) and abaxial (lower) view; G, capsules dehiscent into 4 lobes at maturity; H, seeds red with orange-red caruncula. Photographed by Po-Hao Chen (A–F) and Juinn-Yih Huang (G–H).

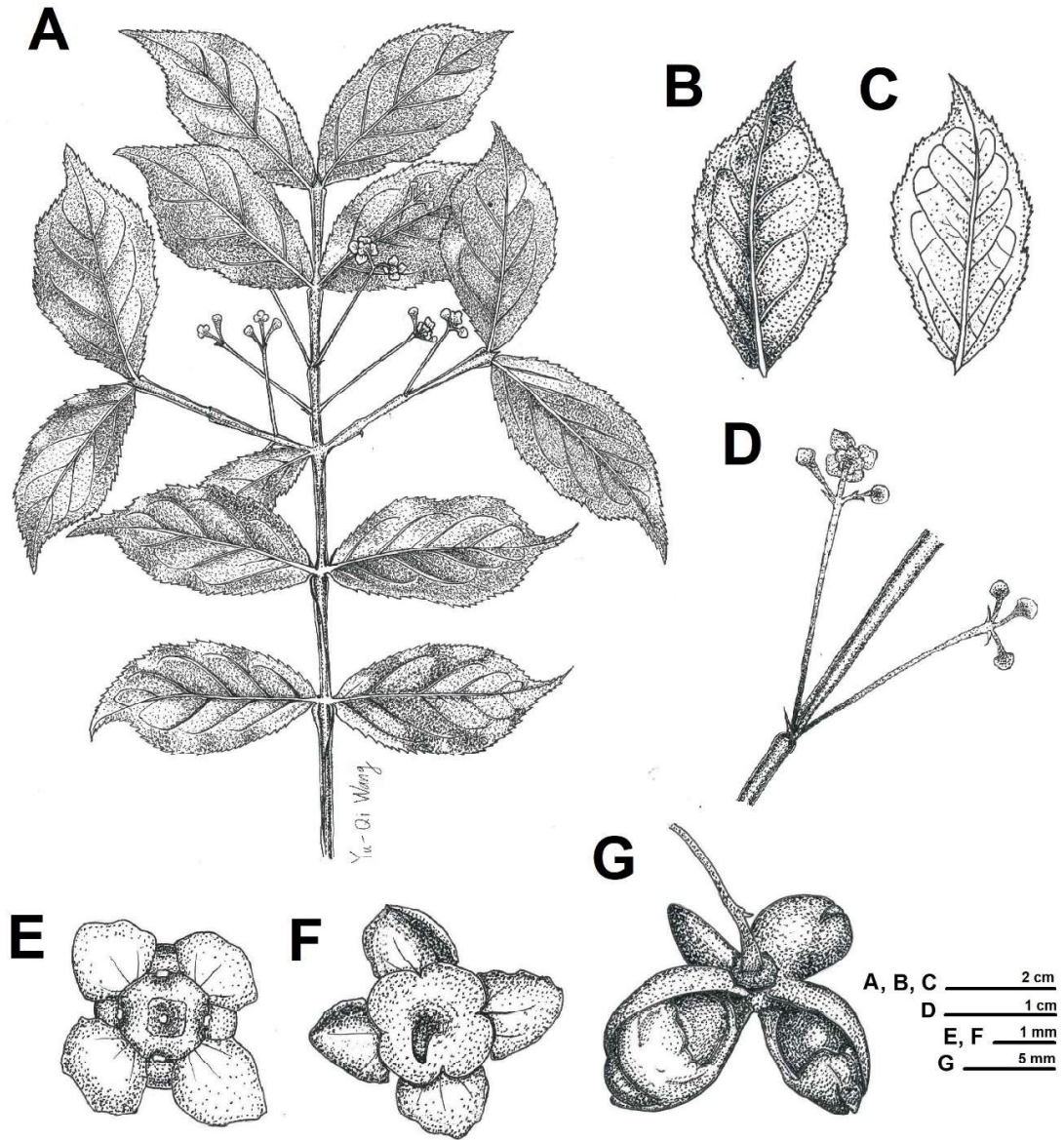


Fig. 2. Line drawings of *Euonymus centidens* H. Lévl. A, flowering branch; B, leaf, adaxial view; C, leaf, abaxial view; D, inflorescence; E, flower, adaxial view; F, flower, abaxial view; G, fruit. Drawing courtesy of Yu-Qi Wang.



Fig. 3. Isotype of *Euonymus centidens* H. Lévl., E. E. Maire s.n. (Royal Botanic Garden, Edinburgh (E), E00275678, photograph).

Table 1. Characteristics of *Euonymus centidens* growing in China, *E. tashiroi*, and *E. centidens* growing in northern Taiwan

	<i>E. centidens</i> (Ma and Funston 2008)	<i>E. tashiroi</i> (Lu and Yang 1993)	<i>E. centidens</i> (this report)
Leaf length ×width (cm)	6–11 × 2.5–4.5	5–10 × 2–4.5	4.3–9.8 × 3–4
Leaf margin	crenulate, serrulate to serrate, or even ciliate	serrate or nearly en- tirely above the mid- dle, and entire beneath the middle	serrulate
Pairs of lateral veins	5–7	ca. 5	4–5
Inflorescence	cymes single or clustered, axillary or terminal	flowers solitary or few clustered	flowers solitary, 2-clus- tered, or in cymes, axil- lary
Peduncle (cm)	2–3	1–5	1.7–2.4
Flower size in diameter (mm)	7–8	ca. 10	5.5–6.5
Petals shape	ovate	ovate	suborbicular
Caruncula color	bright red	bright red	orange-red

jiashan, May 7, 2021, *P.-H. Chen & A.-C. Chung* 3253–3255 (TAIE); June 13, 2021, *P.-H. Chen & A.-C. Chung* 3232–3234 (TAIE). Xiaozishan, August 2, 2021, *P.-H. Chen & A.-C. Chung* 3296–3298 (TAIE).

Distribution: *Euonymus centidens* was

previously recorded in China only, at altitude of approximately 250–1,400 m where it grows in woodlands and forests, and it is very common (Ma 2001). The populations in northern Taiwan grew next to forest hiking trails in a mountainous area at an altitude of approximately

300–600 m, thus representing the easternmost distribution of *E. centidens* in the world.

Habitat and ecology: mainly found in damp and shaded forest habitats, especially near rivers, mature *Euonymus centidens* individuals grow 2–3.5 m tall and show a stem diameter of up to 2 cm. Accompanying plants include *Ardisia sieboldii* Miq., *Arenga tremula* (Blanco) Becc., *Blastus cochinchinensis* Lour., *Elatostema lineolatum* Forst. var. *majus* Thwait., *Eurya chinensis* R. Br., *Ficus fistulosa* Reinw. & Blume, *Heptapleurum heptaphyllum* (L.) Y. F. Deng, *Lasianthus fordii* Hance, *Lasianthus wallichii* (Wight & Arn.) Wight, *Oreocnide pedunculata* (Shirai) Masam., *Saurauia tristyla* DC., *Tetrastigma hemsleyanum* Diels & Gilg, *Wendlandia formosana* Cowan, and *Zanthoxylum scandens* Blume. The flowering period is from May to June and fruiting occurs from June to November.

Discussion

According to the characteristics (Table 1) of *Euonymus tashiroi* and *E. centidens* (Table 1; Lu and Yang 1993; Ma and Funston 2008), and the *E. centidens* population found in northern Taiwan, the most distinguishing characteristic between *E. centidens* and *E. tashiroi* is the leaf margin, which is serrulate in *E. centidens* and serrate or nearly entire above the middle in *E. tashiroi*. However, *E. centidens* in China is deciduous, whereas the population in Taiwan is evergreen. This may be due to climatic differences such as the northeast monsoon in winter, which ameliorates the dry season and facilitates the evergreen habit of *E. centidens* in Taiwan. Further research it is needed to potentially reveal further insights regarding the distribution and history of this species in Taiwan.

IUCN Red list category: Nationally Endangered [D]

Euonymus centidens is currently known to occur in three locations in northern Taiwan, i.e., Xizhi District,

Pingxi District, and Pinglin District. The respective estimated population sizes range from 30 to 50 individuals, with a national total of < 250 individuals. We thus categorized *E. centidens* as nationally endangered in Taiwan [D], according to the IUCN Red List Categories and Criteria (IUCN 2012; Editorial Committee of the Red List of Taiwan Plants 2017).

Acknowledgments

We are thankful to Jo-Ping Hsieh (謝若萍) and Fu-Xing Su (蘇福星) for providing collection information and photographs, and Yu-Qi Wang (王昱淇) for preparing the line drawings of *Euonymus centidens*.

References

- Editorial Committee of the Red List of Taiwan Plants. 2017. The Red List of Vascular Plants of Taiwan, 2017. Endemic Species Research Institute, Forestry Bureau, Council of Agriculture, Executive Yuan and Taiwan Society of Plant Systematics, Nantou.
- IUCN. 2012. IUCN Red List Categories and Criteria: Version 3.1. 2nd ed. Gland, Switzerland and Cambridge, UK: IUCN. iv + 32 pp.
- Liu, H. Y., S. Y. Meng and Q. R. Liu. 2021. A numerical taxonomic analysis of *Glyptopetalum* and *Euonymus* (Celastraceae). *Guihaia* 41(1): 92-102.
- Lu, S. Y. and Y. P. Yang. 1993. Celastraceae. pp 640-660. In: Huang, T. C. et al. (eds.). *Flora of Taiwan* 2nd ed., Vol. 3. Editorial Committee of the Flora of Taiwan, Department of Botany, National Taiwan University, Taipei, Taiwan.
- Ma, J. S. 2001. A Revision of *Euonymus* (Celastraceae). *Thaiszia Journal of Botany* 11: 1-264.
- Ma, J. S. and A. M. Funston. 2008. *Euonymus* L. pp. 440-463. In: Wu, Z. Y. and P. H. Raven (eds.). *Flora of*

China. Vol. 11. Science Press, Beijing and Missouri Botanical Garden Press, St. Louis, USA.

Zhang, X., Z. Zhang and T. Stützel.
2012. Aril development in Celastraceae. Feddes Repertorium 123: 1-11.