

Research note

## ***Callitriche deflexa* A. Braun ex Hegelm., Reconfirmed as a Naturalized Plant in Taiwan**

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### **[ Summary ]**

*Callitriche deflexa* A. Braun ex Hegelm. was once recorded as an uncertain species in the first edition of the *Flora of Taiwan*, but was subsequently eliminated from the flora of Taiwan. Recently, it was found in northern Taiwan and can be easily distinguished from other members of the genus *Callitriche* in Taiwan by its schizocarp with a pedicel up to 4 mm long and usually being longer than the leaves. This paper provides a morphological description, distribution, photographs, and line-drawing to aid its field identification.

**Key words:** Callitrichaceae, *Callitriche*, *Callitriche deflexa*, naturalized plant, Taiwan.

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## 研究簡報

## 台灣一種再確認之歸化植物-柄果水馬齒 (*Callitriche deflexa* A. Braun ex Hegelm.)

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### 摘要

柄果水馬齒曾經被第一版台灣植物誌記載為未確定種，隨後即從台灣植物誌中刪除。該物種最近在台灣北部被發現。本種之離果具果柄長達4 mm，常較葉子長等特徵，可與台灣其他同屬植物區別。本報告提供形態描述、分布現況、生態照片及線描圖供野外判識參考。

關鍵詞：水馬齒科、水馬齒屬、柄果水馬齒、歸化植物、台灣。

陳建帆、林哲緯、楊勝任。2013。台灣一種再確認之歸化植物-柄果水馬齒(*Callitriche deflexa* A. Braun ex Hegelm.)。台灣林業科學28(3):153-8。

### INTRODUCTION

The genus *Callitriche* L. is a monotypic genus of the Callitrichaceae, comprised of roughly 75 species distributed worldwide (Min and Lansdown 2008). In Taiwan, the taxonomic treatment of this genus has noticeably changed in recent years, and only 2 taxa, *Callitriche japonica* and *C. verna*, were previously described (Hayata 1917, Hsu and Yang 1978). After that, Yang and Hsu (1998) reported an invasive species *C. peploides* in the *Flora of Taiwan*. Recently, a revision of the genus *Callitriche* in Central and eastern Asia proposed a new endemic species, *C. ravenniana*, and also transferred *C. verna* to a synonym under *C. palustris* L. It also reported another variety under *C. palustris* in Taiwan (Lansdown 2006b, Min and Lansdown 2008). As a result, 3 species and 2 varieties are recognized in Taiwan.

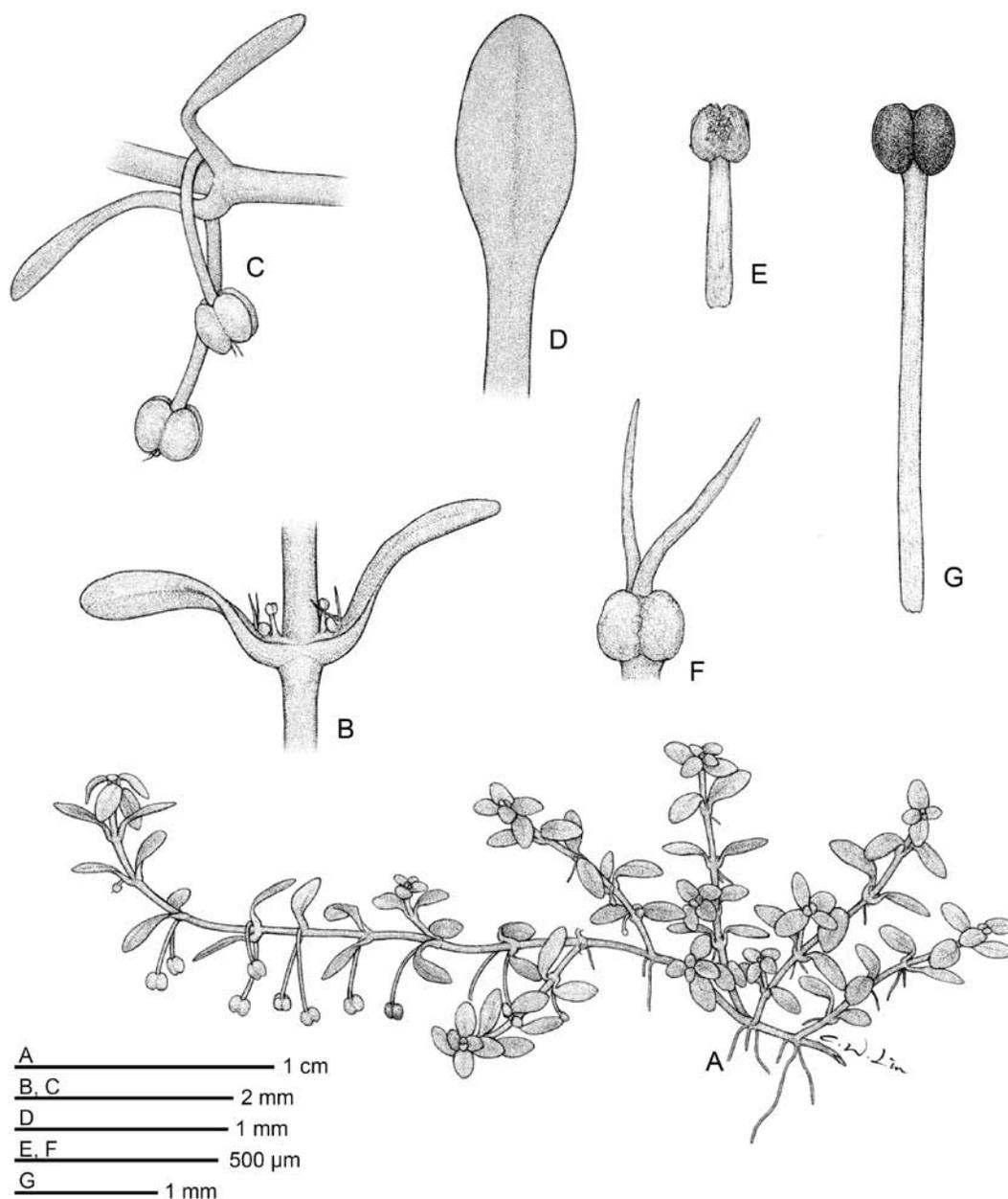
In 2012, a new member of *Callitriche*, *C. deflexa* A. Braun ex Hegelm, was found in Keelung City, northern Taiwan. It was found on the campus of Taipei Medical Univ. in 1970, but no additional voucher specimens

were collected (Hsu and Yang 1978). As a result, it was eliminated from the *Flora of Taiwan* (Yang and Hsu 1998). Recently, we found this species in 2 different habitats in northern Taiwan, and we determined that it can be regenerated by sexual propagation in the wild after 2 yr of observation. The taxonomic treatment, morphological description, distributions, photographs, line-drawings, and the key to the genus in Taiwan are provided to aid field identification.

### TAXONOMIC TREATMENT

*Callitriche deflexa* A. Br. ex Hegelm. Monogr. Callit. 58, t. 3, f. 2, t. 4, f. 4. 1864. ....  
..... 柄果水馬齒 Figs. 1~3.

Annual terrestrial herb. Leaves opposite, oblanceolate or spatulate, rarely obovate, 2~3 mm long, 0.8~1 mm wide, entire, rounded to obtuse at apex, base abruptly narrowed to petiole-like, with an inconspicuous single vein, estipulate. Flower without bracts, 1 staminate and 1 pistillate flower in the same leaf axil; filament straight, 0.3~0.4 mm long,

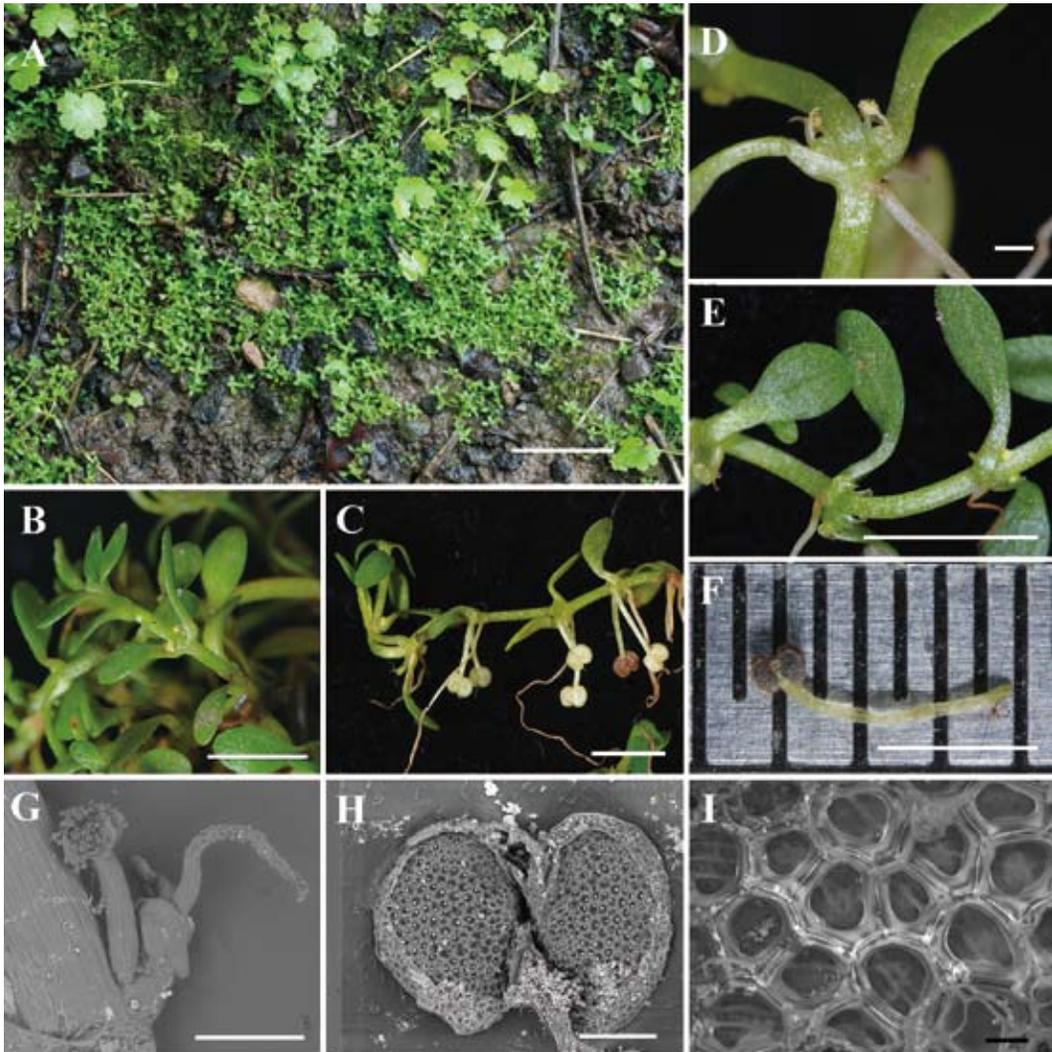


**Fig. 1.** *Callitriche deflexa* A. Braun ex Hegelm. A, Habit; B, male and female flower; C, fruiting branches; D, leaf; E, stamen; F, female flower; G, schizocarp with long pedicel.

anthers 0.1~0.2 mm long, yellow; style up to 0.6 mm long, irregularly erect or ascending, fruit caducous. Schizocarp wider than high, 0.7~0.9 mm wide, 0.5~0.6 mm high, widest in middle; long pedicel, up to 4 mm

long; slightly winged throughout, 0.05~0.075 mm wide. Mericarp reniform, ca. 0.35 mm wide, 0.5 mm long; testa cells in ring, honey-combed, irregular.

Specimen examined: Taiwan: Keelung



**Fig. 2.** Morphology of *Callitriche deflexa*. **A**, Habit; **B**, flowering branch; **C**, fruiting branch; **D**, **G**, staminate and pistillate flowers in the same leaf axil; **E**, abaxial view of leaf, showing the venation; **F**, schizocarp; **H**, the winged fruit; **I**, testa cells of the mericarp. Scale bars **A** = 2 cm; **B**, **C**, **E** = 3 mm; **D**, **G** = 0.3 mm; **F** = 2 mm, **H** = 0.2 mm, **I** = 20  $\mu$ m.

City, Anle Dist., Tawulun (大武崙), 12 May 2012, *C. F. Chen et al.* 3456 (TAIF), same location, 28 Mar. 2013, *C. F. Chen et al.* 4480 (TAIF); New Taipei City, Shiding Dist. Shiding Service Area Station (石碇服務區), 18 Mar. 2013, *T. C. Hsu* 6395 (TAIF).

**Phenology:** Growing period from Jan. to June; flowering and fruiting period from Feb. to June.

**Distribution:** *Callitriche deflexa* is native to Brazil to Argentina in South America, and a few places in Central America (Fassett 1951, Bean 2007). It has now spread to Australia (Bean 2007), Europe (Lansdown 2006a), and Asia (Lansdown 2006b). In Taiwan, it was found in humid soil along a roadside in the north.

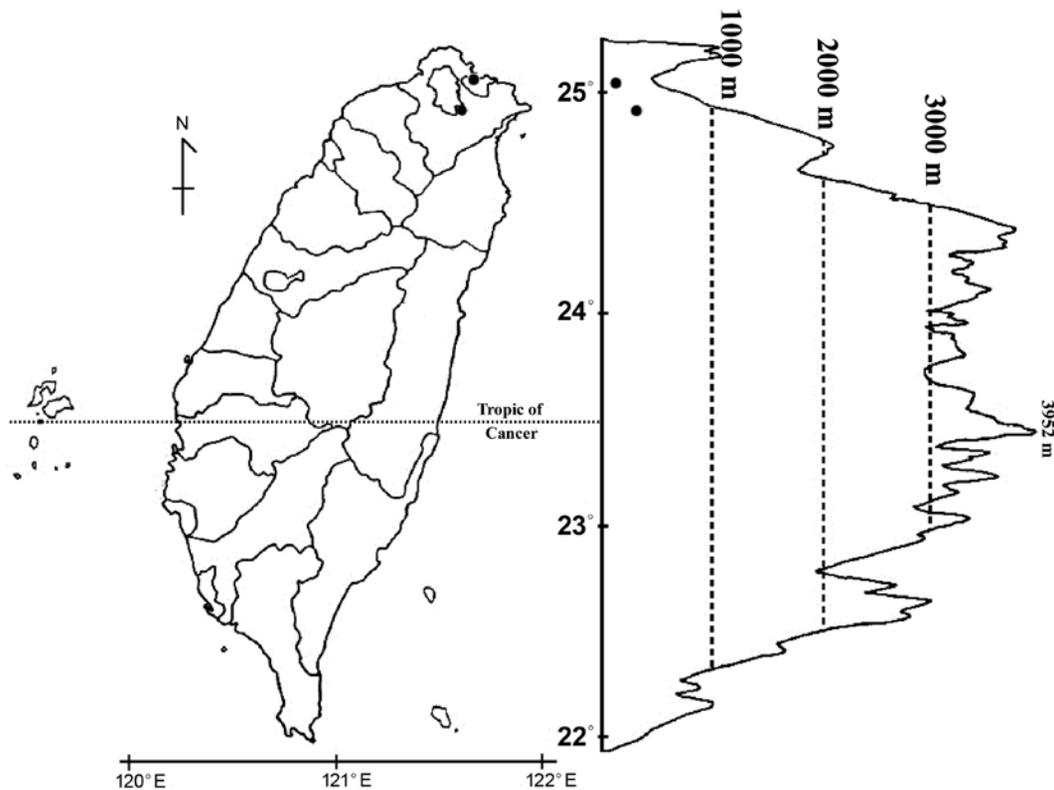


Fig. 3. Distribution map of *Callitriche deflexa* (solid circles).

**Key to species of *Callitriche* in Taiwan**

- 1a. Fruit wingless ..... 2
- 1b. Fruit winged ..... 3
- 2a. Bracts absent; fruit expanded at base to form protruding ridge (strumose).....  
..... *C. peploides*
- 2b. Bracts present; fruit not expanded at base.  
..... *C. palustris*
- 3a. Fruit widest in upper 1/2, tapering from above midpoint to base..... 4
- 3b. Fruit widest in middle ..... 5
- 4a. Bracts absent, leaves very uniform with 3 main veins ..... *C. japonica*
- 4b. Bracts present; leaves variable with 1 to many veins..... *C. palustris*
- 5a. Fruit with a long pedicel up to 4 mm .....  
..... *C. deflexa*
- 5b. Fruit sessile, pedicel < 2 mm .....  
..... *C. raveniana*

**DISCUSSION**

According to the original description and a line drawing in the protologue, *C. deflexa* includes plants with both pedicelled and sessile fruits (Hegelmaier 1864). Subsequently, Hegelmaier (1867) respectively separated them as *C. deflexa* var. *brauniana* and *C. deflexa* var. *austini*. However, Fassett (1951) reduced *C. deflexa* var. *brauniana* to synonymy under *C. deflexa* var. *deflexa*, and *C. deflexa* var. *austini* to synonymy under the new variety, *C. deflexa* var. *subsessilis*. This taxonomic treatment of *C. deflexa* was adopted by several authors (e.g., Bacigulupo 1979, Lansdown 2006b, Bean 2007). In addition, *C. deflexa* var. *subsessilis* was transferred to *C. terrestris* ssp. *subsessilis* by Lansdown (2006a). As a result, *C. deflexa* is characterized by

plants with pedicelled fruits, and is only native to Brazil to Argentina in South America. Therefore, the specimen collected in Taiwan should be classified as *C. deflexa*.

In northern Taiwan, we found it growing in a wet habitat near a roadside in an open space. It was growing under the sidewalk tree *Garcinia subelliptica* and was associated with *Callitriche japonica*, *Hydrocotyle sibthorpioides*, *Lindernia antipoda*, *Mazus pumilus*, *Pilea peplodes* var. *major*, and *Ranunculus cantoniensis*. Due to its tiny fruits, it may have the potential to become more widespread via soil or nursery stock transportation. However, the distribution might be restricted to wet habitats.

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