



Soliva Ruiz & Pavon (Anthemideae, Asteraceae) in Taiwan

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(Received May 13, 1993; Accepted July 31, 1993)

Abstract. The occurrence of *Soliva anthemifolia* (Juss.) R. Br. in Taiwan has been questioned in the literature. In this report we confirm the presence of this species in Taiwan and further document the recent naturalization of a second species of *Soliva*, *S. pterosperma* (Juss.) Less., in Taiwan. Taxonomic treatment, line drawings, and a map showing the distribution of both species on this island are provided.

Key words: Asteraceae; Distribution; Flora of Taiwan; *Soliva anthemifolia*; *Soliva pterosperma*; Taxonomy; Weed.

A single species of *Soliva*, *S. anthemifolia* (Juss.) R. Br., was treated in volume 76(1) of *Flora Reipublicae Popularis Sinicae* (Shih and Fu, 1983), the most recent account of the Asteraceae of China. Although Shih and Fu (1983) include Taiwan among the provinces cited for the Chinese distribution of this species, the occurrence of this genus in Taiwan has been doubted. Huang (1979) listed it as naturalized in the checklist of the *Flora of Taiwan*. Apparently, *Soliva anthemifolia* was recorded on this island as early as 1906 by Matsumura and Hayata. Kitamura (1940) also reported the presence of this species. In the treatment of the *Flora of Taiwan*, however, Li (1978) considered that the report of Matsumura and Hayata (1906) was based on a misidentification of *Cotula chinensis* Kitamura, and that the genus *Soliva* does not occur in Taiwan.

The investigation of the status of *Soliva* in Taiwan was prompted by the recent discovery of a specimen of *Soliva pterosperma* (Juss.) Less. in the Harvard University Herbaria, labeled "Taipei County, Yangming Shan, 10 June 1982, S. C. Shen s.n. (A)." Thinking that this specimen may represent the only documented evidence for the occurrence of the species in Taiwan, a search was undertaken to locate the population and to

find others. During 1991 and 1992 it was confirmed that *S. pterosperma* is thoroughly naturalized on the island (Fig. 1).

Numerous field trips as well as studies of herbarium specimens (see below) revealed that, despite the earlier doubting reports, *S. anthemifolia* is indeed a common and widespread annual weed that occurs on this island (Fig. 1) from late winter through early summer. We also examined the available (three out of four) specimens cited by Li (1978) under *Cotula chinensis* in the *Flora of Taiwan*: in 1932, Kitamura s.n. (TAI); Chuang & Kao 3122 (TAI) and Huang 2188 (TAI). All three specimens turned out to be bona fide *Soliva anthemifolia*. Among these, Kitamura s.n. (TAI) had also been cited by Kitamura (1940) to document the presence of *S. anthemifolia* in Taiwan.

Soliva pterosperma is easily distinguished from *S. anthemifolia* by the completely different achene morphology and position of the capitula. The following key and description serve to readily differentiate the two species of *Soliva* in Taiwan and to supplement the description of *S. anthemifolia* in *Flora Reipublicae Popularis Sinicae*.

- 1a. Leaves 5-15 cm long; heads often restricted to basal portion of the plant, frequently clustered and

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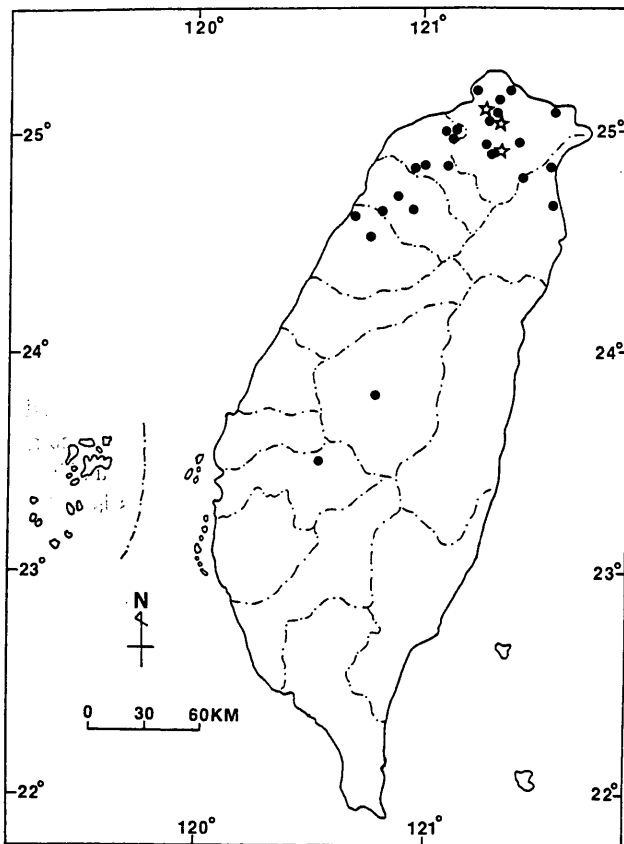


Fig. 1. Distribution of *Soliva anthemifolia* (dots) and *S. pterosperma* (stars) in Taiwan.

rooting at base; disc flowers with 3-lobed corolla and 3 stamens, the style soft to touch at maturity; achenes villous at apex, with thick, corky, rugulose margins 1. *S. anthemifolia*

1b. Leaves 1.5-5 cm long; heads scattered along the stem, never clustered near the base of the plant, not rooting at base; disc flowers with 4-lobed corolla and 4 stamens, the style becoming hard and spinose at maturity; achenes not villous at apex, with thin, papery wings, the wings with an indentation below the middle 2. *S. pterosperma*

1. *Soliva anthemifolia* (Juss.) R. Br. ex Less., Syn. Gen. Comp. 1940; Hu in Quart. J. Taiwan Mus. 21: 162. 1968; Hsu, Illustr. Common Pl. Taiwan 1 (Weeds): 349 & fig. 165. 2nd ed. 1975. Jeng, Common Wildflowers of Taiwan 30 & fig. 13. 1980. Ling & Shih, Fl. Reip. Popul. Sin. 76(1): 135. 1983.

Figs. 1 & 2

Gymnostyles anthemifolia Juss., Ann. Mus. Natl. Hist. Nat. 4: 262. 1804.

Cotula chinensis sensu Li, Fl. Taiwan 4: 840. 1975, pro parte, non L.

Annual herbs, acaulescent, somewhat stoloniferous. Stems much branched. Leaves alternate, in basal rosettes, spatulate in outline, 5-15 cm long, 1-3 cm wide, pilose with long, soft, white hairs on both surfaces, irregularly 1- or 2-pinnately parted; the segments acute at apex, truncate at base, irregularly dentate, the petioles 2-3 cm long, broadened toward base. Inflorescences solitary or clustered at basal nodes, axillary. Heads 5-8 mm long, 6-10 mm across, sessile. Involucre hemispherical, the bracts in 2-3 series, imbricate, oblong, acuminate, membranaceous in margin; the outer 3-3.5 mm long, 1-1.2 mm wide, the inner 3-4 mm long, 0.3-0.6 mm wide. Marginal flowers pistillate, very numerous in several rows, without corolla, the styles persistent. Disc flowers hermaphroditic but sterile, about 8-12, corolla tubular, 1.5-2 mm long, 3-lobed, style capitate at tip, the stamens 3. Achenes wedge-shaped, yellow-brownish, villous at tip, 2-2.5 mm long, 0.1-1 mm wide, with thick, corky, rugulose margins; styles persistent; pappus none.

Specimens examined. TAIPEI CITY: campus of National Taiwan University, roadside, *Hsu 3121* (TAI), *Huang et al. 13* (TAI); campus of National Taiwan University, on traffic islands, *Peng 14819* (HAST); National Taiwan University Farm, *Peng 2573* (TAI); campus of Taipei Medical College, in 1968, *Jeng & Kao s.n.* (TAI); Nankang, campus of Academia Sinica, elev. ca. 30 m, *Peng 11372* (HAST); Nankang, en route from Chunghua Institute of Technology to Nankangshan, border of a vegetable crop, elev. ca. 70 m, *Peng 10433* (HAST); Yangmingshan Park, in vegetable crop, elev. ca. 400 m, *Peng 13598* (HAST); Yangmingshan National Park, Chutzuhu, elev. ca. 600 m, *Peng 12665* (HAST); Yangmingshan Chienshan Park, elev. ca. 430 m, *Peng 13986* (HAST); Yangmingshan, on lawn in campus of Chinese Culture University, elev. ca. 420 m, *Peng 13981* (HAST). TAIPEI HSIEN: opposite side of Tamshui, waste field, fertile soil, *Hsu & Hsu 4371* (TAI), *Pan 4371* (TAI); Tamshui, *Kitamura F-169* (TAI); Kueishan, border of rocky river bed of Peishihsi River, elev. ca. 100 m, *Peng 13918* (HAST); Juifang, waste ground by Chieh-yukeng Bridge, *Peng 15385* (HAST). TAOYUAN CITY: *Shih 62* (PPI).

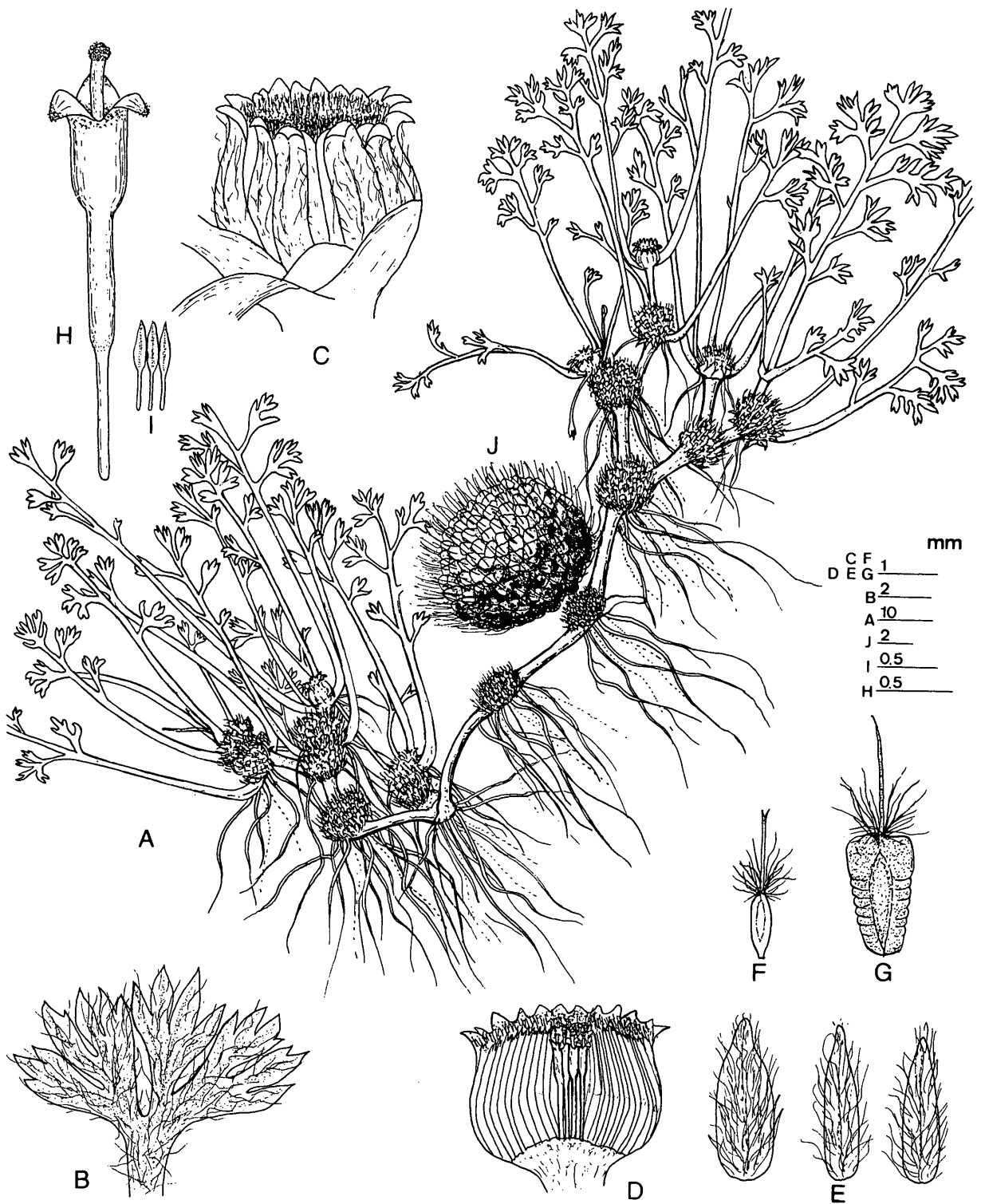


Fig. 2. *Soliva anthemifolia*. A, Habit; B, Leaf segment; C, Inflorescence; D, Longitudinal section of inflorescence; E, Involucral bracts; F, Pistillate flower; G, Achene; H, Hermaphroditic flower (functionally staminate); I, Stamens; J, Infructescence. All from Peng 11372 (HAST).

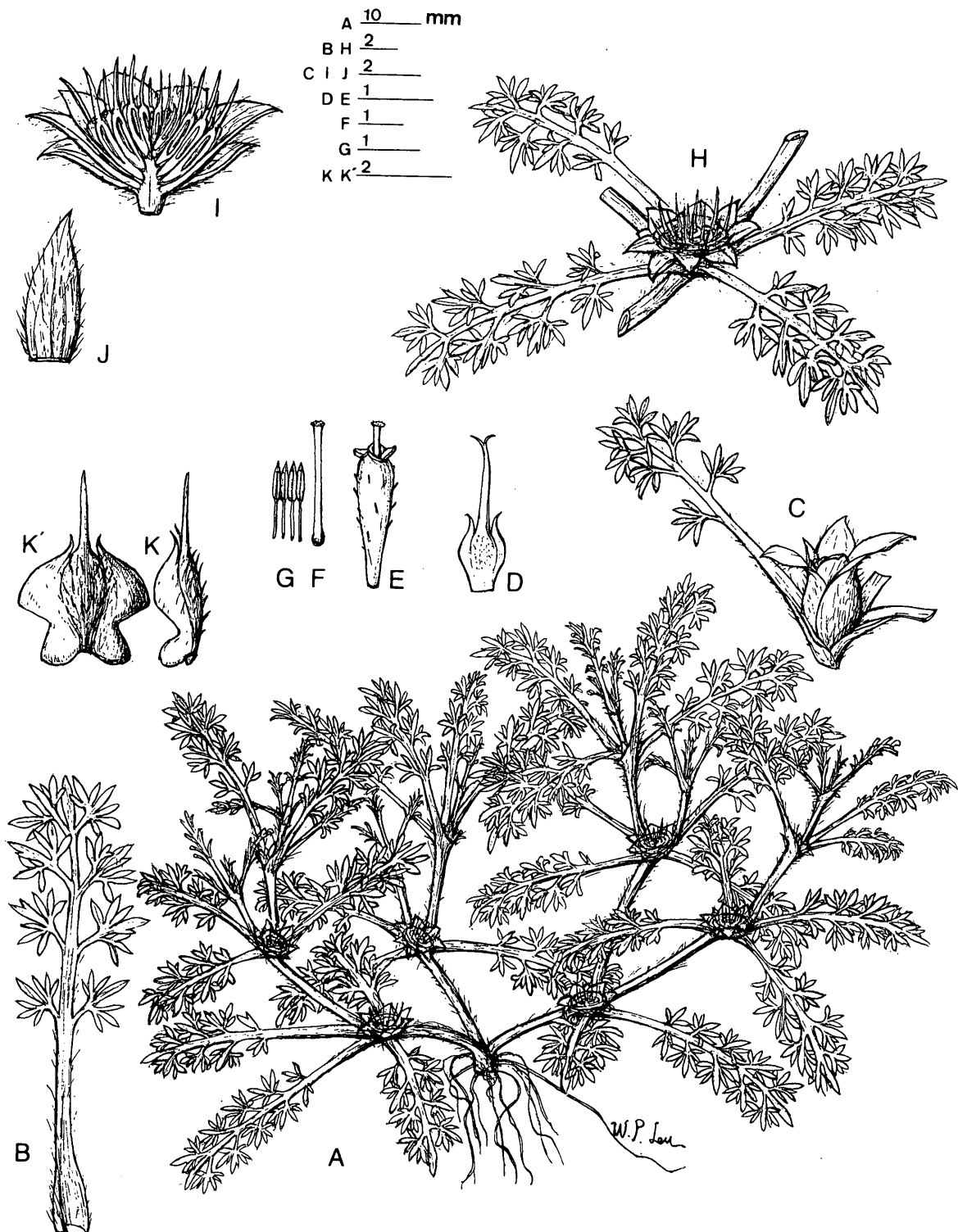


Fig. 3. *Soliva pterosperma*. A, Habit; B, Leaf; C, Inflorescence; D, Pistillate flower; E, Hermaphroditic disc flower (functionally staminate); F, Style; G, Stamens; H, Infructescence with basal leaves; I, Longitudinal section of infructescence; J, Involucrel bract; K, K', Achene. All from Peng 13980 (HAST).

TAOYUAN HSIEN: Puhsing, open fields, *Chuang & Kao 3122* (TAI); Yangmei Dairy Station, Taiwan livestock Research Institute, *Peng 3111* (TAI); Kueishan-chuang, Pingting, elev. 200 m, *Shimada 3394B* (TAI); Tachi, Yuehmei Li, Shanchulu, on lawn by a drainage ditch of Shanchuhu Resort, elev. ca. 60-70 m, *Peng 13694* (HAST). HSINCHU HSIEN: *Huang 2118* (TAI); Hengshan Hsiang, on sandy, alluvial flat west of Yulohsi (River) by Yulohsi bridge, *Peng 13670* (HAST); Chutung, in vegetable crop, elev. ca. 150 m *Peng 13698* (HAST); Shihtoushan, en route from mountain-hiking entrance to parking area, common at exposed sites along trail, elev. ca. 200-300 m, *Peng 14843* (HAST). MIAOLI HSIEN: Chunan, seaside, in *Kandelia candel* mangroves, *Lin 579* (HAST); Shihtan Hsiang, Shihtan, in fallow paddy by a creek, elev. ca. 200m, *Peng 13943* (HAST). NANTOU HSIEN: Sunmoonlake, in 1977, *Yang s.n.* (TAIF); Sunmoonlake, lake shore by Teacher Hostel, elev. 800 m, *Peng 10418* (HAST). CHIAYI HSIEN: Meishan Hsiang, Ketsulin, elev. ca. 900-1000 m, moist grassy field in village (Chiayi Agricultural Exp't Station Herbarium). ILAN HSIEN: Fushan Botanical Garden, along trail, elev. 700-720 m, *Peng 13872* (HAST); Toucheng, Chu-an, sandy seacoast across a cemetery from Chu-an Elementary School, *Peng 13846* (HAST); Wuchieh Hsiang, Chinchui Park, along Tungshan River bank, weedy under a planted tree, *Peng 15274* (HAST).

Distribution. Native of South America, widely naturalized in waste grounds and cultivated fields in Taiwan.

2. *Soliva pterosperma* (Juss.) Less., Syn. Gen. Comp. 268. 1832. Figs. 1 & 3
Gymnostyles pterosperma Juss., Ann. Mus. Natl. Hist. Nat. 4: 262. 1804.

Small annual herbs. Stems decumbent, well branched, the branches ascending, pilose. Leaves alternate, tripinnatifid to tripinnate, 1.5-5 cm long, pilose on both surfaces, the petiole widened beneath flower heads. Heads solitary in leaf axils, sessile, ca. 3 mm long, 5 mm across, scattered along the stem. Involucre hemispherical, the bracts ca. 2 series, subequal, herbaceous, greenish, oblong to lanceolate, pilose on adaxial surfaces, entire and ciliolate on margin, 4-4.5 mm long, 1.5-2 mm wide. Marginal flowers 13-15, in several rows, pistillate, fertile, without corolla, the styles bifurcate at

tip, 1 mm long. Disc flowers 5-6, bisexual but sterile; corolla greenish, tubular, 1.6-1.8 mm long, 4-lobed at apex; style capitate, not branched at tip; stamens 4. Achenes ca. 2 mm long, 3 mm wide, minutely pubescent, with thin planar wings, each wing indented below the middle resulting in a large upper lobe and a smaller basal lobe; styles becoming hard at maturity of achene, persistent and spinose, often with an additional incurved spine on shoulder of each upper lobe.

Specimens examined. TAIPEI CITY: campus of National Taiwan University, on traffic islands, *Peng 14818* (HAST); Yangmingshan, on lawn in campus of Chinese Culture University, very common, *Peng 13980* (HAST); Yangmingshan Chienshan Park, on lawn, abundant, elev. 430 m, *Peng 13985* (HAST). Yangmingshan, in 1982, *Shen s.n.* (A).

Distribution and notes. A native of South America, *Soliva pterosperma* has become fully naturalized in lawns of university campuses and city parks in northern Taiwan within the past decade. It is a particularly noxious weed in lawns, because of the abundant prickly infructescences.

Although Cabrera's (1949) treatment of *Soliva* accepts *S. pterosperma* as one of four species in subgenus *Soliva*, a study by Webb (1986) of introduced *Soliva* in New Zealand indicates that *Soliva* subgenus *Soliva*, in which *S. pterosperma* belongs, may contain only a single highly variable species. None of the achenes from the specimens collected in Taiwan, which all have conspicuous indentations in the lower part of the wings, exactly match the achenes illustrated in Webb's study. A second paper on *Soliva* (Lovell *et al.*, 1986) published simultaneously with the Webb paper provides an alternative point of view, and maintains *S. pterosperma* as a distinct species. Because neither of these studies examined *Soliva* on a worldwide basis we prefer to retain the name *S. pterosperma* for the Taiwan plants. If further studies from the entire range of the genus corroborate Webb's hypothesis, an earlier name for *S. pterosperma*, *S. sessilis* Ruiz & Pavon (1794), will have to be used.

Acknowledgments. We thank Jeremy Bruhl for pointing out the papers by Webb and by Lovell *et al.* and for interesting discussions on *Soliva*. Thanks are due also to Wen-Pen Leu and Kuang-Jung Chang for the line drawings, and to Chih-Huei Chen and Chian-Yi Sue for technical assistance. This study was supported in part by a National Science Council (Taipei) grant to CIP.

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台灣假吐金菊屬植物

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過往分類學者對於菊科植物 *Soliva anthemifolia* (假吐金菊) 是否分布於台灣有疑義。本研究確認假吐金菊自生於台灣全島低海拔地區，並報導此屬另一種原產南美洲之植物 *Soliva pteroperma* (翅果假吐金菊) 已於近年在台灣北部地區歸化。本文對台灣之此屬植物分類特徵及生態環境加以描述，引證台灣採集之記錄標本，提供兩種植物在台灣之分布圖與簡索表，並附植物外形及解剖圖以資辨識。