

OENOTHERA LACINIATA HILL (ONAGRACEAE),
A PREVIOUSLY UNRECORDED SPECIES
IN TAIWAN¹

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Abstract

Oenothera laciniata Hill, an onagraceous species native to temperate and subtropical North America, was recently found naturalized in sandy coastal areas of northern Taiwan. In this study, we give a taxonomic description and illustrations, discuss ecology and habitat, and report the cytology and flavonoid chemistry of this species. Furthermore, a key to distinguish *O. laciniata* from *O. tetraptera*, which has long been known to occur in middle elevations of Taiwan, is provided.

Key words: *Oenothera laciniata*; coastal plant; taxonomy; ecology; cytology; flavonoid chemistry; *Oenothera tetraptera*.

The genus *Oenothera* consists of about 125 species that are widely distributed in temperate North and South America (Wagner, Stockhouse, and Klein, 1985). *Oenothera tetraptera* Cav. is the only species of the genus recorded to occur in Taiwan, mainly at middle elevations (Raven, 1977). In the present study, we report the finding of an additional species, *Oenothera laciniata* Hill, that has been naturalized on sandy coastal areas of northern Taiwan. The species description and illustrations (Figs. 1 and 2) below are based exclusively on live plant materials from Taiwan.

Oenothera laciniata Hill, Hort. Kew. 172/4, tab. 6. 1768; Munz in N. Am. Fl. II. 5: 109. 1965; Dietrich in Ann. Missouri Bot. Gard. 64: 612. 1977; Osada, Col. III. Nat. Pl. Japan 177. 1976; Rostański in Watsonia 14: 30. 1982. 裂葉月見草

Perennial herb from a thick, tap root. Plants erect, up to 45 cm tall, well

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branched in moist, shady places (Fig. 2: A-C), forming a rosette with several to many decumbent branches in more exposed habitats (Figs. 1: A, 2: D). Plants densely strigillose, hirtellous, and villous, glandular pubescent only on the sepals and floral tube. Leaves very narrowly oblanceolate to oblong-elliptic, apex acute, margins pinnatifid, lacinate, variously dentate to subentire, base attenuate, 2-8(-13) cm long, 0.7-2(-2.5) cm wide. Lower leaves with narrowly winged petioles, upper subsessile. Flowers erect, solitary in upper axils, the subtending leaves not reduced to bracts. Buds erect, with 4 pointed, free tips. Floral tube 15-28 mm long, 1.2-1.9 mm in diameter medially. Sepals yellowish green, narrowly triangular, 10-12 mm long, 2.5-3.6 mm wide, reflexed at anthesis; sepal tips corniculate, ca. 1.7-3.5 mm long. Petals 4, yellow, fading rose-pink, obcordate, 13-16 mm long, 15-22 mm wide. Stamens 8: filaments yellow, 7-10 mm long; anthers yellow, 4.2-5.8 mm long, versatile. Style 2.3-3.1 cm long; the stigma lobes linear, 4-5.5 mm long, 0.8 mm thick, surrounded by the anthers at anthesis, the anthers shedding pollen directly on the stigma. Ovary 1.3-1.8 cm long. Capsule narrowly cylindric, straight or slightly curved, (2-)2.5-3.4 cm long, 2.5-2.7 mm thick, with blunt, free and spreading tips, ca. 1 mm long; valves of the capsule curved outward following dehiscence. Seeds brown, obovoid to oblanceoloid, 1-2 mm long, 0.7-1 mm thick, minutely pitted, ascending in each locule. Self-compatible. Flowering time: late spring through summer.

Distribution. Field and waste or disturbed places from Maine to Texas and South Dakota, also naturalized to the Pacific Coast of the United States (Munz, 1965), Paraguay, Brazil (Dietrich, 1977), Great Britain (Rostański, 1982), and Japan (Osada, 1976).

Specimens Examined. TAIWAN: ILAN CO.: Chuangwei District: Sandy coast, Tungkan (東港; 24°43'N-121°49'E), May 28, 1984, H.-F. Huang 2006 (MO, TAI); July 18, 1984, C.-I. Peng 7031 (Herbarium, Academia Sinica, Taipei [HAST]); May 5, 1985, C.-I. Peng & S. Huang 7740 (HAST). TAOYUAN CO.: Tayuan District: Along a cement drainage ditch by a country road, Shalun (沙崙; 25°06'N-121°13'E), May 1, 1985, C.-I. Peng & S. Huang 7721 (HAST); sandy coast, Houtsokang (後厝港; 25°05'N-121°12'E), May 1, 1985, C.-I. Peng & S. Huang 7725 (HAST).

Habitat and Ecology. In Ilan County, *Oenothera laciniata* was found on a sandy beach at the mouth of the Lanyang River (蘭陽溪), associated with *Chenopodium virgatum* Thunb., *Conyza sumatrensis* (Retz.) Walker, *Ipomoea pescaprae* (L.) R. Br. subsp. *brasiliensis* (L.) Oostst., *Ixeris debilis* (Thunb.) A. Gray, *Lactuca indica* L., and *Rumex japonicus* Houtt.

Much more extensive populations of *Oenothera laciniata* were also found on sandy coast around the mouth of the Puhsin River (埔心溪) in Taoyuan County. From there it occurs more or less continuously northeastward to Hsiafu (下福; 25°07'N-121°17'E) in Taipei County (Li, 1985. and Li, pers. comm., 1985), ranging

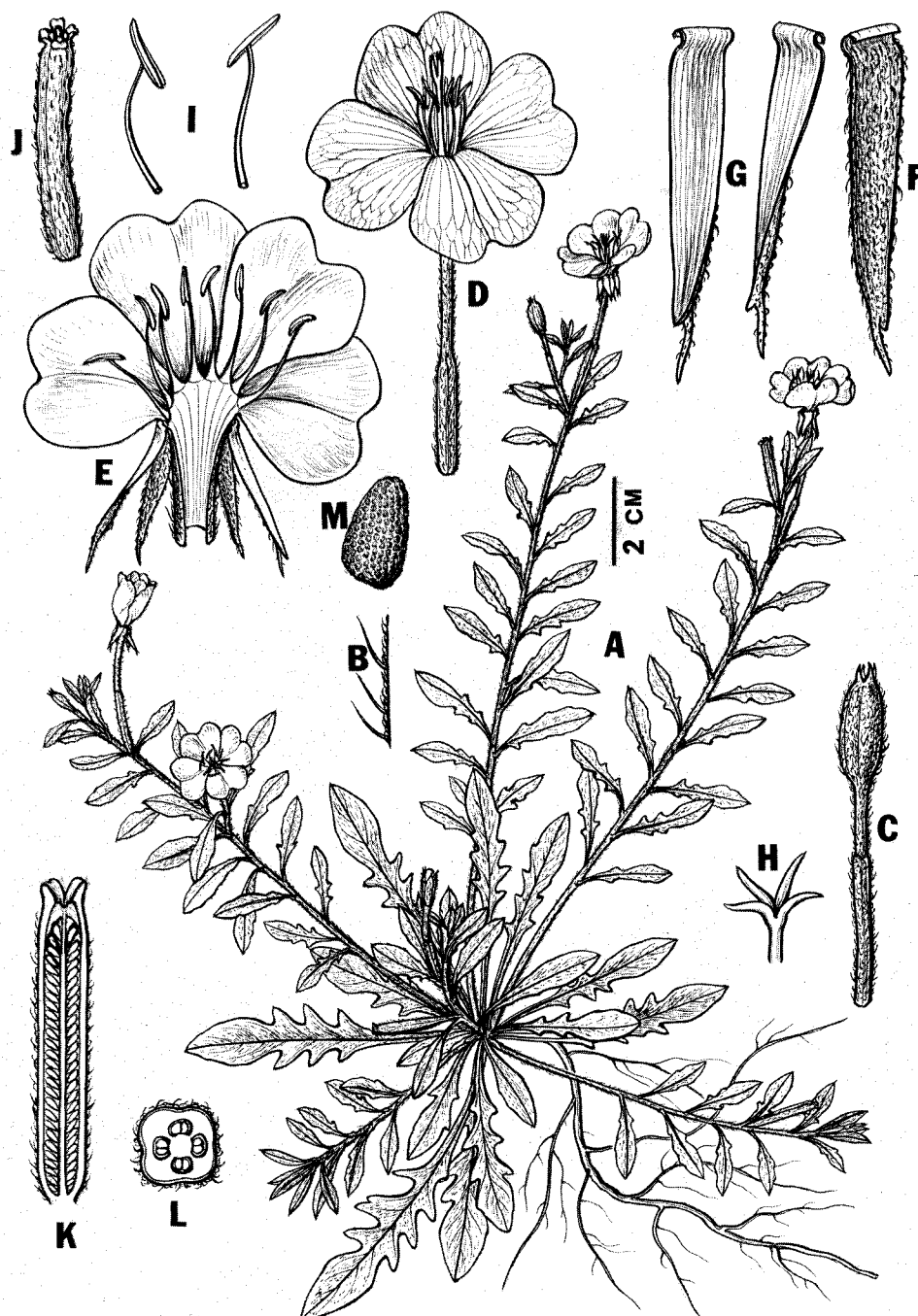


Fig. 1. *Oenothera laciniata*. A. Habit. B. Stem vestiture. C. Flower bud. D. Flower. E. Flower, partly dissected. F. Sepal, abaxial view. G. Sepals, adaxial view. H. Stigma lobes. I. Stamens. J. Fruit. K. Fruit, longitudinal section. L. Fruit, cross section. M. Seeds. All from Peng & Huang 7740 (HAST).



Fig. 2. *Oenothera laciniata*, showing A) yellow flowers at night, B) flowers fading rose-pink during the day, C) erect and well branched stems in moist places, and D) a rosette with many decumbent branches on exposed coastal sand.

along at least 11 km of the coastline. It was not found further northeast, where the coastal dunes prevail (Li, pers. comm., 1985). Further field work is needed for understanding whether, and to what extent, this species has spread southwestward along the coast from the mouth of the Puhsin River.

Populations of *O. laciniata* also appear to be invading inland. In Taoyuan County, they were observed along shoulders of Provincial Route 4, from the seaside all the way to Luchu (蘆竹; 25°03'N–121°17'E), about 10 km inland. Such populations usually co-occur with the more or less weedy species, including *Ambrosia artemisiifolia* L., *Anagallis arvensis* L., *Artemisia capillaris* Thunb., *Bidens pilosa* L., *Conyza bonariensis* (L.) Cronq., *Conyza sumatrensis* (Retz.) Walker, *Cynodon dactylon* (L.) Pers., *Digitaria* sp., *Gnaphalium purpureum* L., *Lilium formosanum* Wallace, *Emilia sonchifolia* (L.) DC., *Lonicera japonica* Thunb., *Oxalis corniculata* L., *Rumex* sp., *Solanum nigrum* L., *Youngia japonica* (L.) DC., etc.

Cytology. We have examined both the meiosis and mitosis of our *Oenothera* collections, using conventional methods (Peng & Chen, 1985). Our study shows that *O. laciniata* is a diploid with $2n=14$, a somatic chromosome count obtained from Peng 7031. The widespread occurrence of reciprocal translocation in natural populations is characteristic of *Oenothera*. Our meiotic preparation from Peng & Huang 7721 can not be analyzed exactly, but appears to represent a large ring of 14 chromosomes, which collaborates the report of Dietrich (1977) for the typical variety of *O. laciniata*.

Flavonoid Profile. Dried leaf material from two populations of this species (C.-I Peng & S. Huang 7721 and C.-I Peng & S. Huang 7740) were recently examined for flavonoids (Huang & Peng, 1985). Methanolic extracts from the leaves yielded five flavonols: kaemferol 3-0-glucoside, quercetin 3-0-glucoside, quercetin 3-0-glucuronide, quercetin 3-0-rhamnoglucoside, and quercetin 3-7-0-diglucoside, compounds common in the genus *Oenothera* (Howard, Mabry & Raven, 1972).

Notes. *Oenothera laciniata*, as witnessed by the authors, is very abundant in part of the sandy coast of northern Taiwan. Villagers at Houtsokang, Taoyuan County, say they observed plants of this species since at least some 20 years ago. *Oenothera laciniata* probably had not naturalized to Taiwan at the time Suzuki (1937) published his list of coastal plants of this island. However, it was apparently overlooked by all recent authors on littoral plants of Taiwan (Hong, Meng, Li, & Chen, 1976, 1978, & 1981; Hsu, Lu, Chiou, & Fan, 1983; Jeng, 1984), probably as a result of not having visited these remote localities where it occurs.

Since more than one species of *Oenothera* have now been found on this island, a key to the species of *Oenothera* in Taiwan is appropriate here.

- 1a. Petals white in early anthesis; capsules obovoid, distinctly 4-winged; seeds smooth, clustered in many rows per locule; plants occurring at middle elevations.....*O. tetraptera*
- 1b. Petals yellow in early anthesis; capsules narrowly cylindric, not winged; seeds minutely pitted, in 2 rows per locule; plants occurring mainly on sandy coast, or at lowland..... *O. laciniata*

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臺灣新記錄柳葉菜科植物——裂葉月見草

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裂葉月見草 (*Oenothera laciniata* Hill) 爲柳葉菜科 (Onagraceae) 植物，原產北美洲溫帶及亞熱帶地區，並已歸化南美巴西、巴拉圭，以及英國、日本等地。晚近在臺灣北部宜蘭縣蘭陽溪出海口（東港）沙灘、以及桃園縣埔心溪出海口（後厝港）至臺北縣下福之間的濱海地區，發現大量的野生裂葉月見草族羣。本文除對其分類性狀及生育地生態加以描述外，並附植物繪圖及植物彩色照片以資辨識；所製作之檢索表，以便於區別本種與中海拔地區生長之月見草 (*Oenothera tetraptera*)；此外並報導其染色體數目與類黃酮化學成份。

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