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Portulaca psammotropha Hance (Portulacaceae), a Neglected Species in the Flora of Taiwan and the Philippines

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ABSTRACT: A neglected species in the Flora of Taiwan and the Philippines (the Batan islets), *Portulaca psammotropha* Hance, is described and illustrated. Herein, *Portulaca quadrifida* var. *formosana* and *P. insularis* are treated as synonym of *P. psammotropha*. This species is a typical littoral plant that is scattered on coral sands and coral reef in the archipelago around SE China. It can be characterized by leaves alternate; leaf blade quite fleshy, oblong to obovate-oblong, 3-10 mm long, apex obtuse; petals 5, yellowish, ca. 3-5 mm long. The stamen number and stigma lobes of this species vary among the populations observed.

KEY WORDS: Neglected species, *Portulaca psammotropha*, Portulacaceae, Taiwan, Philippine.

INTRODUCTION

The genus *Portulaca* (Portulacaceae) is comprised of about 150 species, mostly distributed in arid tropical and subtropical regions, particularly Africa and South America, with a few species extending into temperate regions. Some of them are cultivated for medicinal or horticultural uses. In Taiwan, three to five *Portulaca* species were recognized by different authors (Liu, 1996; Yang et al., 1999; Lu and Gilbert, 2003), and some species remain taxonomically doubtful. Hayata (1911) reported *Portulaca quadrifida* var. *formosana* from Kotosyo (Lanyu) and later (1917) elevated it to species level. This species was often reduced to *Portulaca quadrifida* (Hatusima, 1976; Yang and Liu, 2002; Lu and Gilbert, 2003). However, according to the original description (Hayata, 1911), *P. quardrifida* var. *formosana* has alternate phyllotaxis and obovate blade that is significantly differed to the description of *Portulaca quadrifida*. Hosokawa (1932) reported another species, *Portulaca insularis*, from Liuciou, Pingtung Co. This species was often included in the widespread species *P. pilosa* subsp. *pilosa* (Geesink, 1969; Liu, 1996; Yang and Liu, 2002), but the treatment was not accepted by Lu and Gilbert (2003).

Portulaca psammotropha Hance was first described from a collection made on Tungshatao (Prata Island), a small coral islet located in northeastern South China Sea. In recent vegetation investigation of Tungshatao (Huang et al., 1994), both *Portulaca oleracea* and *P. quadrifida* were recorded in the genus *Portulaca*. *Portulaca psammotropha*, the type of which was collected from Tungshatao, was not mentioned in that research. In a monograph regarding *Portulaca* species around the Pacific (Geesink, 1969), almost all species with linear to elliptic leaves were included within *P. pilosa*, among which eight subspecies were divided. *Portulaca psammotropha* was considered insufficiently known but annotated to be probably *P. pilosa* L. ssp. *pilosa*. Lu and Gilbert (2003) listed *Portulaca psammotropha* in the Flora of China and mentioned that it is also distributed in Taiwan. However, the authors did not mention any extant voucher specimens or references. Since this species was not listed in other reports or checklists regarding the flora of Taiwan (Liu and Chen, 1976; Liu, 1996; Yang et al., 1999; Yang and Liu, 2002; Boufford et al., 2003), it is necessary to clarify the occurrence of *Portulaca psammotropha* in Taiwan.

The habit is fairly uniform throughout the genus *Portulaca*. Most of the diagnostic features in leaves and flowers were usually not well-preserved in specimens. In addition, the flowering period of *Portulaca* flowers is usually short, lasting for only a few hours, thus it is difficult to get flowering specimens from various localities. Because of this, *Portulaca psammotropha* has never been thoroughly examined morphologically, nor has it been sufficiently compared with other species of the same genus using fresh materials. In this study, we confirmd the existence of *Portulaca psammotropha* in Taiwan and Philippine (the Batan Isltes).

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Portulaca quadrifida L. var. *formosana* Hayata and *P. insularis* Hosokawa should be treated as synonym of *P. psammotropha*. Since this species was not recorded in the enumeration of plants in the Philippines (Merrill, 1923) and the Batan Islets (Hatusima, 1966), it might be a new record of flowering plant in the Philippines. The distribution and morphological characters of this species were also discussed.

Key to the species of *Portulaca* in Taiwan

1. Petals usually purple to red, if yellow then purple outside; leaves linear
   2. Petals 1 cm long or less ..... *P. pilosa* subsp. *pilosa*
   2. Petals over 1 cm long ..... *P. pilosa* subsp. *grandiflora*
1. Petals yellow; leaves not linear
   3. Petals 4; leaves opposite, acute at apex ..... *P. quardrifida*
   3. Petals mostly 5; leaves alternate, obtuse or rounded at apex
      4. Axillary hairs present; leaves fleshy, to 2.5 mm thick, less then 1 cm long, with white-green stripes on the surface; flowers mostly solitary, rare as many as 3 together; mature seeds often ± iridescent ……..... *P. psammotropha*
      4. Axillary hairs absent; leaves less than 1mm thick, 1.5-4 cm long, without white-green stripes on the surface; flowers often in clusters of 3 or more; mature seeds never iridescent ……..……. *P. oleracea*

TAXONOMIC TREATMENTS

Portulaca psammotropha Hance, Ann. Bot. Syst. 2: 660. 1851; Lu and Gilbert, Fl. China 5: 443. 2003. 沙生馬齒莧 Figs. 1-3

Portulaca formosana (Hayata) Hayata, Gen. Ind. Pl. Form. (Icon. Pl. Form. 6, suppl.) 7. 1917. *syn. nov.*
Portulaca hainanensis Chun and How, Acta Phytotax. Sin. 7 (1): 8-9. 1958.
Portulaca insularis Hosokawa, Trans. Nat. Hist. Soc. Formosa 22(121): 229. 1932; Liu and Chen, Fl. Taiwan 2: 316. 1976; Lu and Gilbert, Fl. China 5:442-443. 2003. *syn. nov.*
Portulaca pilosa auct non. L.: Geesink, Blumea 17: 294-298. 1969; Liu, Fl. Taiwan, 2nd ed. 2: 335-336. 1996. (subsp. *pilosa*) *pro parte.*
Portulaca quadrifida L. var. *formosana* Hayata, J. Coll. Sc. Imp. Univ. Tokyo 30(1): 37. 1911. *syn. nov.*
Portulaca quadrifida auct. non L.: Hatusima, Fl. Ryukyus 266. 1971; Huang et al., Taiwania 39(1-2):45. 1994.

Herbs perennial, 3-10 cm high, much-branched, with herbaceous stems from a short woody basal stem. Roots fleshy. Stems not articulated, diffuse, branched basally, 1-2 mm thick; leaf axils more or less villous. Leaves alternate, subsessile; leaf blade to 2.5 mm thick, fleshy, oblong to obovate-oblong, 3-10 mm long, base obtuse, apex obtuse or rounded. Flowers solitary, about 1-1.6 cm in diameter, surrounded by involucre of 4-6 bracts. Sepals ovate-deltate, ca. 2.5 mm, veined. Petals 5, yellow or yellowish, elliptic, 2.5-3.0 mm long. Stamens 10-30. Ovary ovoid. Stigma 2-5-lobed. Capsule glossy straw colored apically, broadly ovate, compressed, 2.5-4.5 mm long, 2.5-3.5 mm wide. Seeds black, turning iridescent gray when fully mature, orbicular-reniform, ca. 0.7 mm; testa cells interlocking, slightly raised.

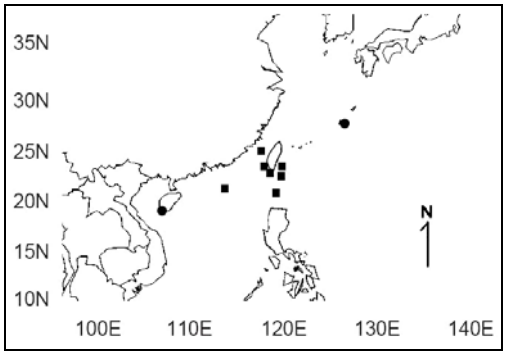

Fig. 1. Distribution of *Portulaca psammotropha* Hance. (■): Specimens seen by the authors. (●): Reports from literature.

Distribution: North Philippine (Batan Is.), South China (Hainan), Tungshatao, South Taiwan (Kenting, Liuciou, Lutao, Lanyu and the Penghu Islets), and the Ryukyus (Ikei Islet). On coral sands or coral reefs, occasionally in crevices of artificial cement structure at coastal region.

Phenology: Flowering and fruiting observed throughout the year in Tungshatao, and mainly in summer to autumn in Taiwan.

Specimens examined: Taiwan: Kaohsiung City, Tungshatao, 29 Mar 2004, *C. L. Lin 40* (TAIF); 4 Feb 2007, *T. C. Hsu 707* (TAIF); 26 Apr 1994, *T. C. Huang et al. 16533* (TAI); 15 Jun 1908, *T. Kawakamii 4621, 4658* (TAIF). Pingtung County: Kengting, 5 Oct 1967, *C. C. Hsu & R. Hsu 4210* (TAI); Liuciou (Liukiusyo), 30 Dec 1929, *T. Hosokawa 1628* (*holotype* of *Portulaca insularis* Hosokawa, TAI); *T. Hosokawa 1629* (TAI); 26 May 2007, *P. F. Lu 13858* (HAST); Taitung County: Lutao, 16 Aug 1958, *T. I. Chuang & C. C. Hsu 2283* (TAI); Lanyu, 10 Nov 2006, *P. F. Lu 12700* (HAST); Penghu County: Penghu Islet, 4 Aug 1973, *T. C. Huang & M. T. Kao 6807* (TAI); Shiyui, 24 Mar 1972, *C. C. Hsu & C. S. Kuoh 14043* (TAI); Shiyu Islet, 26 Jun 1985, *K. S. Hsu s. n.* (TAIF). Philippine: Batan Island, 24 May 2005, *S. W. Chung 12546* (PNH).

DISCUSSION

We checked the specimen indicated as "*Portulaca quadrifida*" by Huang et al. in TAI (*Huang 16533*), though no flower preserved, the plants have alternate, obtuse leaves contrast to *P. quadrifida* which has opposite and acute leaves (Liu, 1996; Lu and Gilbert, 2003). According to our field survey in Feb, 2007 and the examination of herbarium specimens, we are

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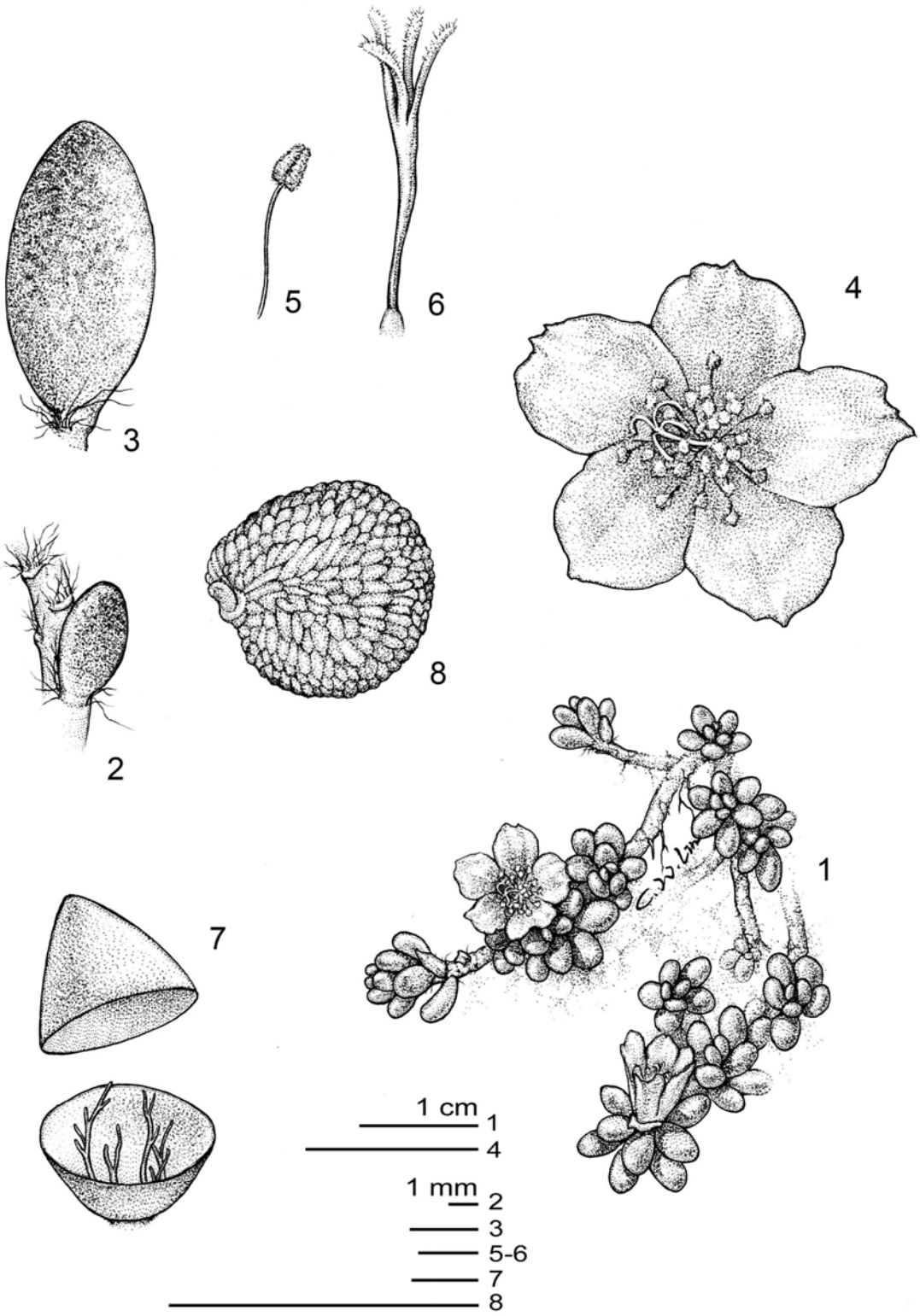

Fig. 2. *Portulaca psammotropha* Hance. 1: Habit. 2: Stem and leaf. 3: Leaf. 4: Flower. 5: Stamen. 6: Stigma. 7: Capsule. 8: Seed. All drawn from *T. C. Hsu 707*, TAIF.

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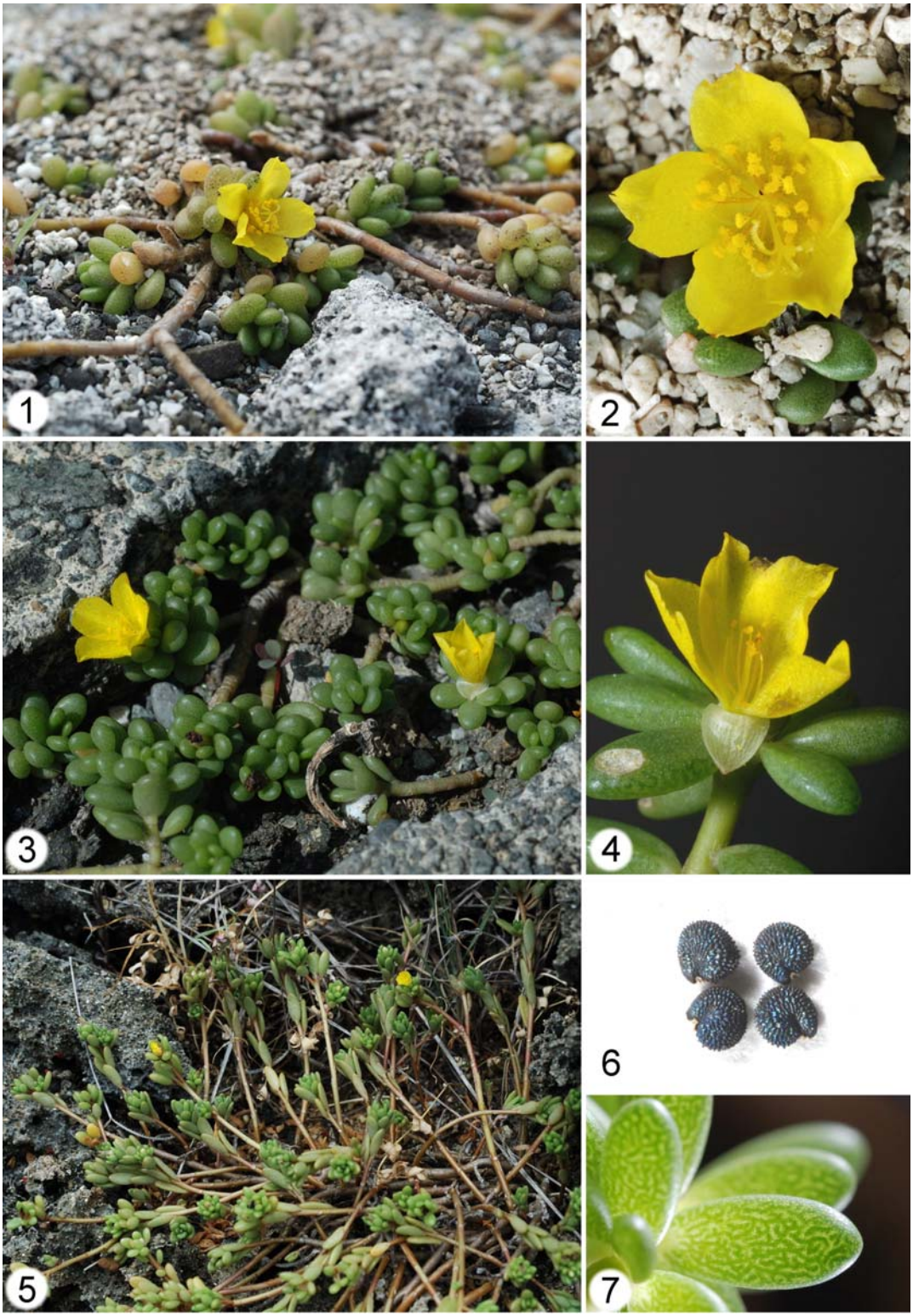

Fig. 3. *Portulaca psammotropha* Hance. 1-2. Plants in Tungshatao. 1: Habitat and habit. 2: Flower. 3-4. Plants in Lanyu. 3: Habitat and habit. 4: Flower, one petal removed, showing fewer stamens than the Tungshatao population. 5: Plants in Kenting seashore. 6: Seeds. 7: Leaves.

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Table 1. Comparison of some variable characters among different populations of *Portulaca psammotropha* Hance. All characters were observed from fresh materials.

Locality	Tungshatao	Penghu	Kenting	Batan	Liuciou	Lanyu
Stamen no.	22-30	25-30	12-18	11-14	8-12	8-12
Stigma	4-5 lobed	4-5 lobed	4-5 lobed	3-4 lobed	2-3 lobed	2-3 lobed
Annotation	Type locality of *P. psammotropha*				Type locality of *P. insularis*	Type locality of *P. quadrifida* var. *formosana*

assured that there were two *Portulata* species occurring in Tungshatao, *P. oleracea* and *P. psammotropha*; Huang et al.'s collection of "*P. quadrifida*" is definitely *P. psammotropha. P. quadrifida*, which was previously reported, is actually not found in that island.

Plants of *Portulaca psammotropha* had been collected several times in southern Taiwan and nearby islets (Lanyu, Lutao, Liuciou, and the Penghu Islets), but most specimens were determined as *P. pilosa*, *P. quadrifida*, or *P. insularis* in herbaria. Although some floral characters are different between populations from different locations (Table 1), they are considered here as a single species based on the following reasons:

1. Identical plant form, seed morphology and habitat in different populations.
2. Correlation of geographical distribution.
3. A clear separation between populations could not be evaluated by multiple characters.

According to our observation on fresh materials, *Portulaca psammotropha* can be characterized ecologically by coral-reef-seashore habitat and morphologically by leaves alternate; leaf blade quite fleshy, oblong to obovate-oblong, less then 1 cm long, apex obtuse; petals 5, yellowish, ca. 3-5 mm long; seed iridescent gray. Necessity of intraspecific taxonomy should be further considered on account of the variation of stamen number and stigma lobes between the populations.

Three *Portulaca spp.* were found in Lanyu in our recent survey, including *P. oleracea*, *P. pilosa* and *P. psammotropha*. Among them, characters of *P. psammotropha* agree most to the original description of *P. quadrifida* var. *formosana* (Hayata, 1911). Although there are some differences between fresh materials from Lanyu and Tungshatao (Table 1), these differences were considered as variations in species according to the reasons mentioned above.

Populations found in Liuciou were identical to those in Lanyu (Table 1). The only difference between the description of *P. insularis* (Hosokawa, 1932) and fresh materials collected from Liuciou was the corolla color, which was red mentioned by Hosokawa (1932) while yellow observed in field. We checked the type specimen of *P. insularis* in TAI, though flower absent, the preserved habits fit quite well to *P. psammotropha* instead of *P. pilosa* subsp. *pilosa*, the only known red-flowered species occurred in Liuciou. Thus we treated the species published by Hosokawa (1932) as a synonym of *Portulaca psammotropha*.

Although Geesink (1969) included both *Portulaca psammotropha* and *P. insularis* in *P. pilosa* ssp. *pilosa*, we took Lu and Gilbert's opinion (2003) that Geesink's treatment (1969) of *P. pilosa* was too inclusive and covered a number of distinct species in East Asia. *Portulaca pilosa* and *P. psammotropha* are clearly discriminated by flower color, leaf shape and habitat. These variations are not continuous and represent different reproduction strategies. We thus treat these taxa as an independent species as Lu and Gilbert (2003) did.

In addition to the specimens examined by us, we followed Lu and Gilbert (2003) who considered *P. hainanensis* from Hainan, China as a synonym of *P. psammotopha*. The Ryukyu species recorded as *P. quadrifida* might also be *P. psammotropha* according to the description made by Hatusima (1971). Therefore, we are confirmed that *Portulaca psammotropha* populations scatter on seashores of the archipelago around SE China (Fig. 1).

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臺灣與菲律賓植物誌中疏漏的植物：沙生馬齒莧(馬齒莧科)

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摘　　要

本文描述一種臺灣與菲律賓(巴丹群島)植物誌疏漏的植物：沙生馬齒莧，探討其分類地位及分布情形，並將寶島馬齒莧 *Portulaca quadrifida* var. *formosana* 與島嶼馬齒莧 *P. insularis* 處理為本種的異名。沙生馬齒莧是典型的海濱植物，已知散生於中國大陸東南側島弧之珊瑚沙灘與珊瑚礁石上。本種具有下列形態特徵：葉互生，厚肉質，長橢圓至倒卵狀長橢圓形，長 3-10 公釐，先端鈍；花瓣 5，黃色，3-5 公厘長。而雄蕊與柱頭裂片的數目則在族群間有所不同。

關鍵詞：沙生馬齒莧、馬齒莧科、疏漏種、臺灣、菲律賓。

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