**Lilium longiflorum** var. **longiflorum** (Liliaceae), a neglected lily of Taiwan

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Lilium longiflorum var. longiflorum (Liliaceae), a neglected lily of Taiwan

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Abstract

Background

The genus Lilium comprises ca. 100 species and famous byb its showy flowers. In Taiwan, four taxa were recorded in Flora of Taiwan, namely L. callosum, L. formosanum, L. speciosum var. gloriosoides, and L. longiflorum var. scabrum.

New information

In this article, the author reported a newly recorded lily taxon, Lilium longiflorum Thunb. var. longiflorum. This variety is morphologically similar to the other two endemic taxa, L. longiflorum Thunb. var. scabrum Masam. and L. formosanum Wallace of Taiwan, and is often misidentified as such. However, L. longiflorum var. longiflorum is distinguished from them by having subglabrous stems, and tepals without purplish stripes. Lilium longiflorum var. longiflorum has only been found in the remote islands of Taiwan, such as Lanyu, Lutao, and Pengchia Islet. The conservation status of the two varieties of L. longiflorum of Taiwan was re-evaluated and assigned as near threatened (NT).

Keywords

Liliaceae, Lilium longiflorum Thunb. var. longiflorum, plant taxonomy, Taiwan

Introduction

Lilium L. is the type genus of Liliaceae which comprises about 110 species distributed in subtropical to alpine regions of the northern hemisphere, especially in East Asia (Chen et al. 2000, Tamura 1998). The characteristic species of this genus are bulbiferous perennial herbs, with sessile or sub-sessile leaves, terminal inflorescences of colorful, nectar-bearing flowers, 3-loculed superior ovaries with numerous ovules, and loculicidal capsules with
flattened seeds (Chen et al. 2000, Utech 2002, Ying 2000). In Taiwan, four taxa were treated in the second edition of Flora of Taiwan (Ying 2000), namely *L. callosum* Siebold & Zucc., *L. formosanum* Wallace, *L. longiflorum* Thunb. var. *scabrum* Masam., and *L. speciosum* Thunb. var. *gloriosoides* Baker. Among these, *L. formosanum* and *L. longiflorum* var. *scabrum* are similar in morphology and classified into section *Leucolirion*, which includes species with trumpet-shaped flowers, recurved tepals and filaments and a relatively large stigma (Comber 1949).

The record of *L. longiflorum* in Taiwan can be traced back to Henry (1896), who compiled the first comprehensive plant list of Taiwan. He recorded this species in Tamsui and the South Cape region. In 1906, Matsumura and Hayata (1906) confirmed Henry's record and reported specimens from Senton and Biōritsu. Kawakami (1910) recorded this species in Taiwan without location and specimen information. Hayata (1917) included *L. longiflorum* in his list of Taiwanese plants, stating that the specimen was not found by him, but that the record might have come from the survey of Matsumura and Hayata (1906). Sasaki (1928) and Masamune (1936) recorded this species on the east coast of Taiwan in Lutao and Lanyu. Masamune (1939) described a new variety *L. longiflorum* var. *scabrum* based on the presence of scabrous stems. Masamune (1954) made a new combination of this variety under *L. japonicum*, as *L. japonicum* Houtt. var. *scabrum* (Masam.) Masam. However, Liu and Ying (1978) and Ying (2000) did not accept this taxon and considered *L. japonicum* var. *scabrum* as a synonym of *L. longiflorum* var. *scabrum*. The records of *L. longiflorum* of Sasaki (1928) and Masamune (1936) were treated as misinterpretations of *L. longiflorum* var. *scabrum* by Liu and Ying (1978) and Ying (2000).

Upon visiting Lanyu for the first time in 2009, the author noticed a native lily that had white flowers without purplish stripes. This specimen was different from the other taxa native to Taiwan, and plants were collected for identification on a subsequent visit to Lanyu. After reviewing the relevant literature, this lily was identified as *L. longiflorum* var. *longiflorum*, and was mentioned only in some informal records provided by local plant enthusiasts in the online forum, Nature Campus (Ahsiang 2014), and on Facebook (Yang 2017). Although many photos and morphological comparisons were provided for identification, formal records with detailed morphological description, specimen examinations, distribution maps, and conservation status were needed for this taxon.

### Materials and methods

Study materials were obtained from herbarium sheets and field investigation. The following herbaria were examined: HAST, TAI, TAIF, TCF, TNM, and PPI, and the herbarium acronyms were those given by Thiers (2020). Voucher specimen were deposited in TCF and TAIF. Evaluation of conservation status of *L. longiflorum* var. *longiflorum* and *L. longiflorum* var. *scabrum* of Taiwan followed the criteria of Editorial Committee of the Red List of Vascular Plants of Taiwan (2017).
Taxon treatment

*Lilium longiflorum* longiflorum Thunb.

**Materials**

- **a.** country: Taiwan; county: Taitung; locality: Lanyu Township, Tungching; year: 1976; month: 1; day: 11; fieldNumber: C. E. Chang 938; institutionCode: PPI
- **b.** country: Taiwan; county: Taitung; locality: Little Lanyu; year: 2003; month: 3; day: 21; fieldNumber: C. L. Yeh & C. R. Yeh 86; institutionCode: PPI
- **c.** country: Taiwan; county: Taitung; locality: Lanyu; year: 2015; month: 4; day: 5; fieldNumber: P. H. Chen 593; institutionCode: PPI
- **d.** country: Taiwan; county: Taitung; locality: Lanyu; year: 1962; month: 4; day: 22; fieldNumber: C. E. Chang 2877; institutionCode: PPI
- **e.** country: Taiwan; county: Taitung; locality: Lanyu; year: 1926; month: 6; day: 8; fieldNumber: S. Sasaki s.n.; institutionID: 29261; institutionCode: TAI
- **f.** country: Taiwan; county: Taitung; locality: Lanyu; year: 1920; month: 2; day: 7; fieldNumber: S. Sasaki s.n.; institutionID: 29264; institutionCode: TAI
- **g.** country: Taiwan; county: Taitung; locality: Lanyu; year: 1924; month: 5; fieldNumber: S. Sasaki s.n.; institutionID: 29265; institutionCode: TAI
- **h.** country: Taiwan; county: Taitung; locality: Lanyu; year: 1907; month: 4; day: 15; fieldNumber: S. Sasaki s.n.; institutionID: 29262; institutionCode: TAI
- **i.** country: Taiwan; county: Taitung; locality: Lanyu; year: 1984; month: 6; day: 15; fieldNumber: W. L. Chiou 11472; institutionCode: TAIF
- **j.** country: Taiwan; county: Taitung; locality: Lanyu; year: 1985; month: 4; day: 3; fieldNumber: T. Y. Yang 1610; institutionCode: TNM
- **k.** country: Taiwan; county: Taitung; locality: from RadWaste Administration's nuclear waste depository to Helmet Rock; year: 1993; month: 2; day: 28; fieldNumber: H. L. Ho 1113; institutionCode: HAST, PPI
- **l.** country: Taiwan; county: Taitung; locality: Lanyu Imororu; year: 1936; month: 4; day: 9; fieldNumber: H. Simada SH1344; institutionCode: TAI
- **m.** country: Taiwan; county: Taitung; locality: Chingching grassland; year: 2007; month: 2; day: 7; fieldNumber: Y. R. Chen & S. P. Chi 45; institutionCode: TAI, TAIF
- **n.** country: Taiwan; county: Taitung; locality: Chingching grassland; year: 2005; month: 3; day: 26; fieldNumber: T. Y. A. Yang 17241, 17242, 17243; institutionCode: TNM
- **o.** country: Taiwan; county: Taitung; locality: Chingching grassland; year: 1997; month: 7; day: 6; fieldNumber: T. Y. A. Yang et al. 8526; institutionCode: TNM
- **p.** country: Taiwan; county: Taitung; locality: between Dongching and Yeyin; year: 1983; month: 6; day: 8; fieldNumber: C. I Peng 5215; institutionCode: HAST
- **q.** country: Taiwan; county: Taitung; locality: Dongching; year: 1983; month: 6; day: 8; fieldNumber: C. I Peng 5187; institutionCode: HAST
- **r.** country: Taiwan; county: Taitung; locality: Yurenhsi to Hungtoushan; year: 1984; month: 5; day: 8; fieldNumber: C. I Peng 6623; institutionCode: HAST
- **s.** country: Taiwan; county: Taitung; locality: en route from Kaiyuan Port to Tank Rock; year: 1984; month: 5; day: 7; fieldNumber: C. I Peng 6607; institutionCode: HAST
- **t.** country: Taiwan; county: Taitung; locality: Hongtou Village; year: 1998; month: 5; day: 21; fieldNumber: T. Y. A. Yang 10432; institutionCode: HAST, TNM
- **u.** country: Taiwan; county: Taitung; locality: Yehyu Village, Pond Hsiaotienchi; year: 1997; month: 4; day: 21; fieldNumber: T. Y. A. Yang 7938; institutionCode: HAST, TNM
as. country: Taiwan; county: Taitung; locality: Lutao Township, Hotspring Village; year: 2005; month: 4; day: 21; fieldNumber: G. P. Hsieh 2043; institutionCode: PPI
at. country: Taiwan; county: Taitung; locality: Yeh-yu Village, at the hill of Wu-Kong Cave; year: 1978; month: 2; day: 4; fieldNumber: C. E. Chang 12071; institutionCode: PPI
au. country: Taiwan; county: Taitung; locality: Isl. Kwasyoto; year: 1929; month: 1; day: 1; fieldNumber: S. Sasaki s.n.; institutionID: 29259; institutionCode: TAI
av. country: Taiwan; county: Taitung; locality: Isl. Kwasyoto; year: 1927; month: 5; day: 5; fieldNumber: S. Sasaki s.n.; institutionID: 29260; institutionCode: TAI
aw. country: Taiwan; county: Taitung; locality: General Rock; year: 2003; month: 3; day: 29; fieldNumber: H. P. Su & Y. T. Hsu s.n.; institutionID: 438128; institutionCode: TAIF
ax. country: Taiwan; county: Keelung; locality: Pengjia Islet; year: 2005; month: 6; day: 7; fieldNumber: S. W. Chung 7796; institutionCode: TAIF

Description

Perennial bulbiferous herbs. Bulbs subglobose, creamy white or tinged yellow. Stem erect, sparsely scabrous pubescent, 20-100 cm tall, 0.5-1 cm in diam., subglabrous, sparsely covered with papillae. Leaves alternate, lanceolate to oblong-lanceolate, 2-20 cm long, 0.3-1.3 cm wide, smaller toward apex, thick and somewhat fleshy, base truncate, sessile, margin entire, apex acuminate, glabrous on both surfaces, venation ternate. Inflorescence terminal, solitary or several flowers scattered, showy, fragrant. Flowers white, tepals 6, free, oblong-lanceolate, recurved at apex, 11-16 cm long, 3-4 cm wide, glabrous. Stamens 6, opposite to tepals, filaments filiform, 9-10 cm long, ca. 2 mm in diam., pale-green, glabrous; anthers oblong, versatile, longitudinally dehiscent, ca. 6 mm long by 3 mm wide, yellow, glabrous. Ovary cylindrical, ca. 3 cm long, ca. 2.5 mm in diam., pale-green, glabrous; style straight, 7-8 cm long, ca. 2 mm in diam., pale-green, glabrous, stigma 3-lobed, ca. 1 cm in diam., slimy. Capsules erect, 5-9 cm long, 1-2.5 cm wide, brown. Seeds numerous, flattened, brown, glabrous (Fig. 1).

Distribution

Distributed in Kyusyu (Yakushima and Tanegashima) and the Ryukyus of Japan (Hayashi 2016). In Taiwan, this variety is found in Lutao, Lanyu, and Pengchia Islet, in the exposed seashore and hills.

Identification keys

| Key to *Lilium* taxa of Taiwan |
|--------------------------------|
| 1 Flowers not trumpet-like, often nodding; tepals strongly recurved | 2 |
| – Flowers trumpet-like, horizontal; tepals recurved only at apex | 3 |
| 2 Leaves linear; flowers orange without reddish spots | *L. callosum* |
- Leaves lanceolate; flowers white with reddish spots  
  *L. speciosum* var. *gloriosoides*

3 Leaves linear; stems glabrous  
*L. formosanum*

- Leaves lanceolate, stems more or less covered with scabrous pubescence  
  4

4 Stems sparsely scabrous pubescent; flowers white, stems green, both without purplish stripes  
*L. longiflorum* var. *longiflorum*

- Stems densely scabrous pubescent; flowers and stems with purplish stripes  
  *L. longiflorum* var. *scabrum*

**Discussion**

**Morphological comparison of Taiwanese *Lilium* sect. *Leucolirion***

*L. longiflorum* var. *longiflorum* is morphologically similar to *L. longiflorum* var. *scabrum* and *L. formosanum*, which all belong to sect. *Leucolirion* (Comber 1949, Nishikawa et al. 1999). *Lilium longiflorum* var. *longiflorum* differs from *L. longiflorum* var. *scabrum* in its smooth stem with sparse scabrous pubescence (Masamune 1939) and white flowers with purplish stripes. *Lilium longiflorum* differs from *L. formosanum* by its lanceolate and tri-nerved leaves and self-incompatible habit (Ascher and Peloquin 1968, Hayashi 2016) (Fig. 2).

**Distribution and conservation status of Taiwanese *L. longiflorum***

According to the red list of vascular plants of Taiwan from the Editorial Committee of the Red List of Vascular Plants of Taiwan (2017), *L. longiflorum* var. *scabrum* was classified as data-deficient (DD), because there was insufficient data to precisely evaluate its rank. *Lilium longiflorum* had been misidentified as *L. formosanum* in many herbarium sheets and vice versa; thus, the population and distribution of *L. longiflorum* in Taiwan was not clear. The taxonomic status of the two varieties of *L. longiflorum* has been described in the present study, along with the distribution of *L. longiflorum* var. *longiflorum* in Lutao, Lanyu, and Pengchia Islet, the neighboring islands of Taiwan. In contrast, *L. longiflorum* var. *scabrum* was found in the north to northeast area of Taiwan and not in the other islands (Fig. 3). The two taxa shared similar habitats in grasslands, forest borders, rocky slopes and cliffs overlooking the seashore. Based on this distribution information, the conservation status was reevaluated following the criteria proposed by the Editorial Committee of the Red List of Vascular Plants of Taiwan (2017). The populations might have decreased because of development in these areas, but the regeneration is still considered good and the conservation status of the two varieties of *L. longiflorum* was evaluated as near threatened (NT) (A3).
Haw (1986) averred that *L. longiflorum* might be a naturalized plant rather than a native one in Taiwan, as this species was cultivated in a graveyard in the Ryukyus, and could have been introduced into Taiwan in the same way. However, the populations of *L. longiflorum* var. *scabrum* scattered on the coastal areas of northern Taiwan had scabrous stems, which is different from the Japanese plants, and thus could not be naturalized. The other taxon, *L. longiflorum* var. *longiflorum* was only found in a few islands. If this distribution pattern was formed by human activity, then some unique custom of this plant would have been expected to be found, but no such custom was found in these islands; therefore, the distribution pattern of *L. longiflorum* var. *longiflorum* could only be explained by natural colonization and not by human activity.

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Figure 1.
*Lilium longiflorum* Thunb. var. *longiflorum*. A habitat B habit C leaf adaxial surface D leaf abaxial surface E tepal adaxial surface F tepal abaxial surface G stamen H pistil. Scale bar = 3 cm.
Figure 2.
*Lilium longiflorum* Thunb. var. *longiflorum*. A habitat B habit C leaf adaxial surface D leaf abaxial surface E tepal adaxial surface F tepal abaxial surface G stamen H pistil. Scale bar = 3 cm.
Figure 3.
Distribution map of *Lilium longiflorum* var. *longiflorum* (red), and *L. longiflorum* var. *scabrum* (blue).