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Rongxin Huang,  Taohua Yuan, Yi Chen, Mei-Jun Li, Xinxiang Bai

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# Five new synonyms in *Impatiens* (Balsaminaceae) of China

RONG-XIN HUANG<sup>1</sup>, TAO-HUA YUAN<sup>3</sup>, YI CHEN<sup>1</sup>, MEI-JUN LI<sup>1</sup>,  
XIN-XIANG BAI<sup>1, 2\*</sup>

<sup>1</sup>College of Forestry, Guizhou University CN-550025 Guiyang, Guizhou, China

<sup>2</sup>Qianxinan Academy of Agricultural and Forestry Sciences, CN-562400 Xingyi, Guizhou, China

\*Corresponding author: Xinxiang Bai (254715174@qq.com)

## Abstract

In the process of research on the genus *Impatiens* L. in China, we found that there were synonyms amongst some species. *Impatiens procumbens* Franch. morphologically resembled *I. reptans* Hook.f., *I. crassiloba* Hook.f., *I. ganpiuana* Hook.f., *I. atherosepala* Hook.f. and *I. rhombifolia* Y.Q.Lu & Y.L.Chen. After a thorough morphological study, based on original literature, type specimens and field surveys, it was found that the above six genera of *Impatiens* had no substantial differences in morphological characters and there was continuity in geographical distribution. Therefore, we determined that *I. reptans*, *I. crassiloba*, *I. ganpiuana*, *I. atherosepala* and *I. rhombifolia* are the synonyms of *I. procumbens*. At the same time, we present the colour photographs, supplementary descriptions of morphology, geographical distribution and the lectotype of *I. procumbens*.

## Keywords

China, *Impatiens*, new synonyms, lectotypification

## Introduction

In China, 352 species of *Impatiens* have been recorded, including 273 species endemic to China, which are concentrated throughout the Qinling Mountains, southern Tibet, the Hengduan Mountains, Yunnan–Guizhou–Guangxi karst region, the middle and lower reaches of the Yangtze River and other regions (Yuan et al. 2022). It is well known that *Impatiens* species are notoriously difficult to classify, because of their abundant character variations, which makes the boundary between species very blurred (Grey-Wilson 1980; Tian 2007; Cong et al. 2007). From the perspective of research history, there were many factors in the early published species, such as the distance between collectors and researchers, the collection of specimens with the same number in different herbaria, the change of place names etc., all of which have led to the taxonomic problems, for example, the same species with different names, the absence of characters, and the misloadings. Additionally, these classification problems have not been resolved so far and some early published species have not been found since publication, which is not conducive to the research of *Impatiens*, but also causes some obstacles to the research of this genus. *I. procumbens* was published by Franch (1886) on the basis of specimens collected from Dali, Yunnan Province. *I. reptans*, *I. crassiloba*, *I. Ganpiuana*, and *I. atherosepala* were published by the British plant taxonomist J. D. Hooker, based on specimens collected from Guizhou Province by French priests or missionaries E. M. Bodinier and J. P. Cavalerie (Hooker 1908a, 1908b). *I. rhombifolia* was published by Yilin Chen and Yingqing Lu (1990), based on specimens collected from Mount Emei, Sichuan Province.

Yu (2008) mentioned that *I. reptans*, *I. Ganpiuana*, *I. procumbens* and *I. rhombifolia* were very similar in morphology, and may be described repeatedly. Through a large number of field investigations and textual research of specimens, it was found that there were no essential differences amongst the above six species. In addition, the guidelines and recommendations of Article 9 of the ICN (Turland et al. 2018) have been followed while designating the lectotype.

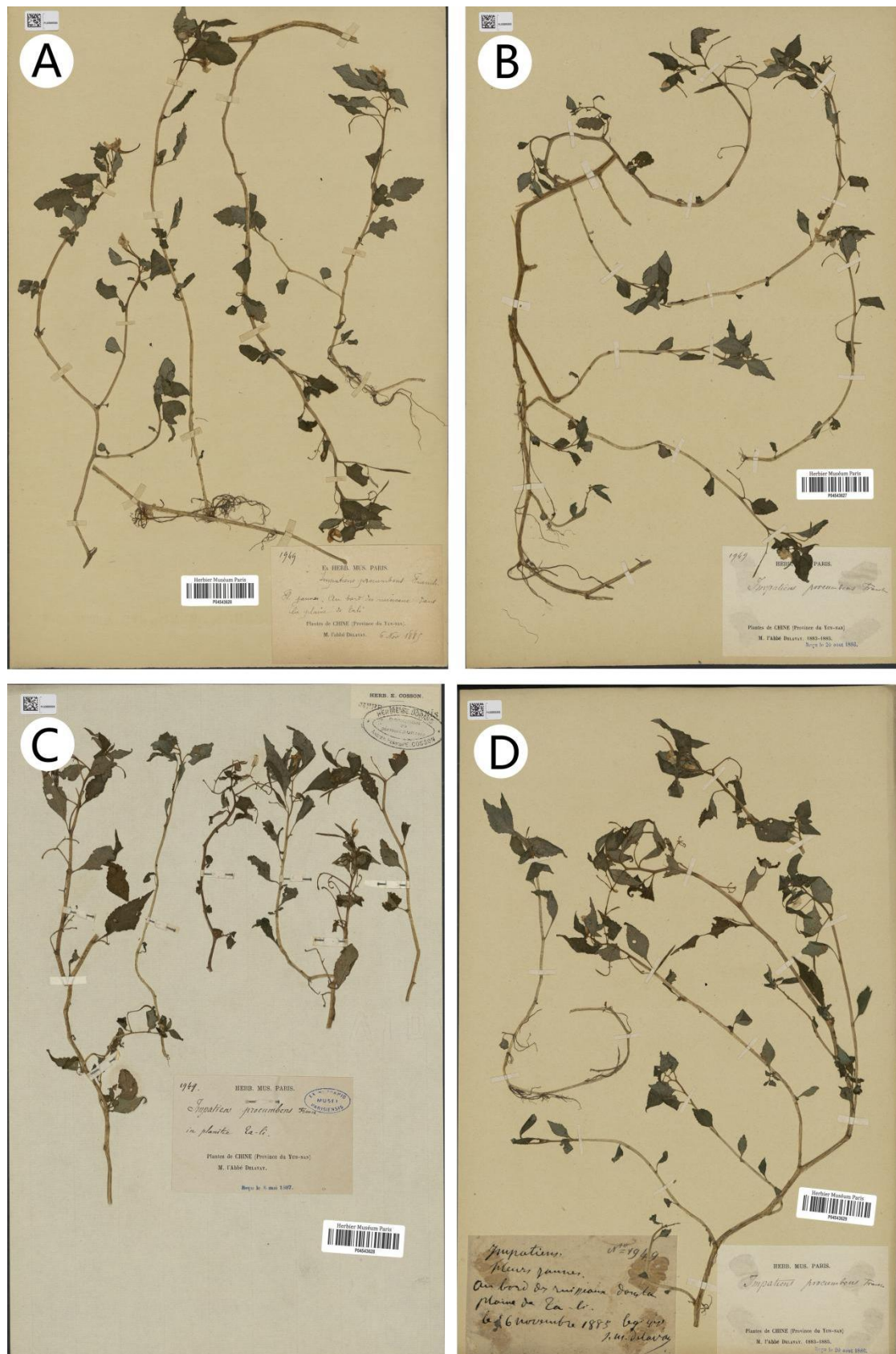
## Materials and Methods

For morphological comparisons, we reviewed the original literature and related records, including the original literature description of each species, information of type specimens, synonyms and geographical distribution. The main sources of original literature are from Tropicos (<http://www.tropicos.org>), IPNI (<http://www.ipni.org>) and other websites. Otherwise, we also critically checked type specimens or high-resolution images of specimens involved in this study in BM, E, K, P, NY, PE, IBSC, KUN, KUN, HGAS, GZAC, GZTM, SWFC etc. and also conducted fieldwork of type localities in Sichuan, Guizhou and Yunnan Provinces. The main contents of this paper include observation and record of habitat, field distribution and flowering stage and careful observations and photography of leaf, flower, fruit and other morphological characteristics of the plants.

## Results and discussion

After consulting the type specimens (Fig. 3.1, Figs. 3.2 and 3.4-B) of *Impatiens procumbens* from Dali, Yunnan, *I. reptans* from Guiyang, Guizhou and *I. rhombifolia* from Emei, Sichuan (Fig. 3.2, G-J), as well as the specimens in domestic and foreign herbaria and relevant literature records, it was found that there were no obvious differences in morphology amongst the three kinds of *Impatiens* (Table 3.1).

In the process of textual research on the type specimen of *Impatiens reptans*, we found that the labelling information of E00313595 was marked "An idem au no. 1782?". At the same time, the vernacular name "*Impatiens ganpiuana* Hf Vav" (Fig. 3.2-B) was found on the label at the lower right corner. These two uncertain point to the need for further textual research of *I. ganpiuana*. Meanwhile, the collection information marked on the type specimens (Fig. 3.4-A and C) of *I. crassiloba* and *I. ganpiuana* were the same, namely *E. M. Bodinier 1782*, the collection time of the latter being 9 August, 1897. Although there was no collection time on the specimen of the former, it could be inferred that the collection time may be from the same period according to the marked information that the specimens were received on 26 April 1898. Compared with the character description of the protologue, the differences mainly lay in the shape of the lower sepal and anther (Table 3.1), but by examining type specimens (Figure 3.5), the shape of the lower sepal of *I. ganpiuana* should be cymbiform, so there was no obvious difference except for the different anther.



**Figure 3.1** *Impatiens procumbens*. A Lectotype (P00780766). B-D Isolectotype (P04543629, P04543628, P04543627).

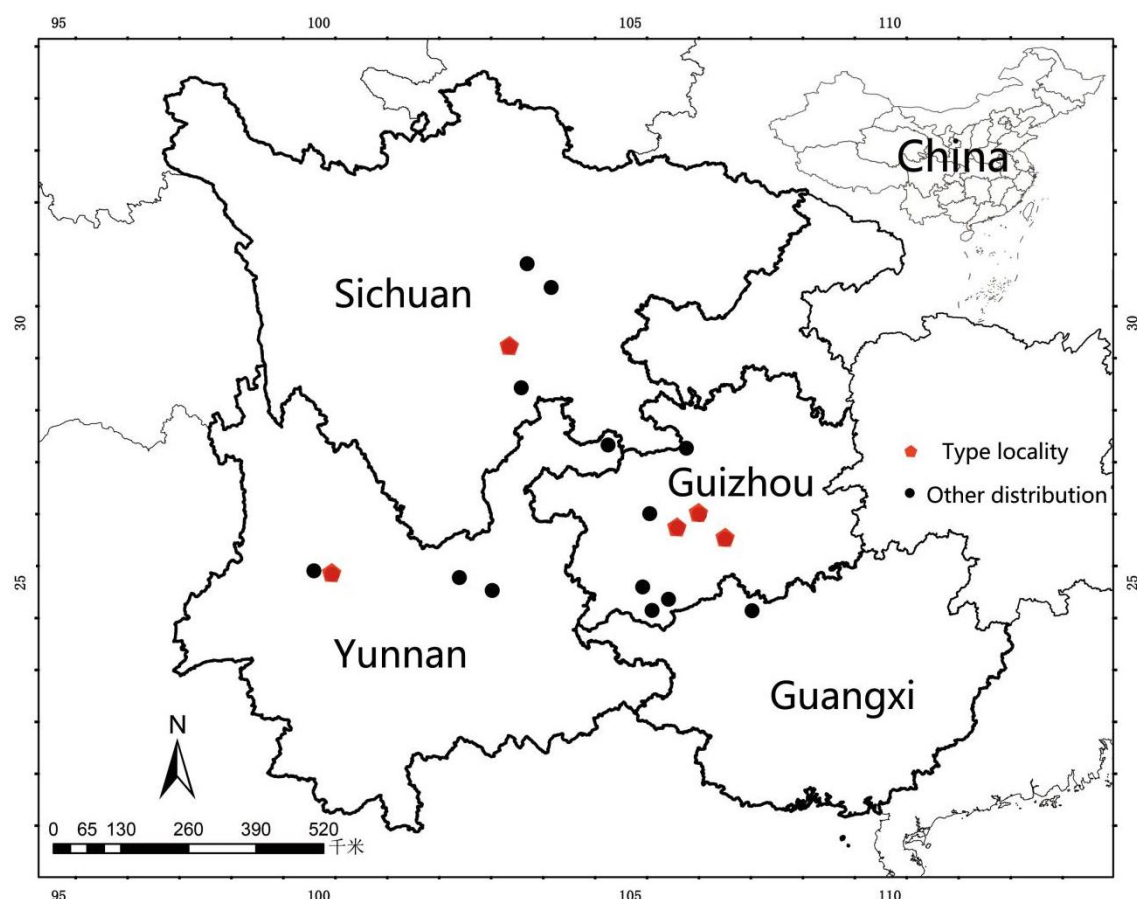




**Figure 3.2** *Impatiens reptans* (syntype). A P00780766. B E00313595.

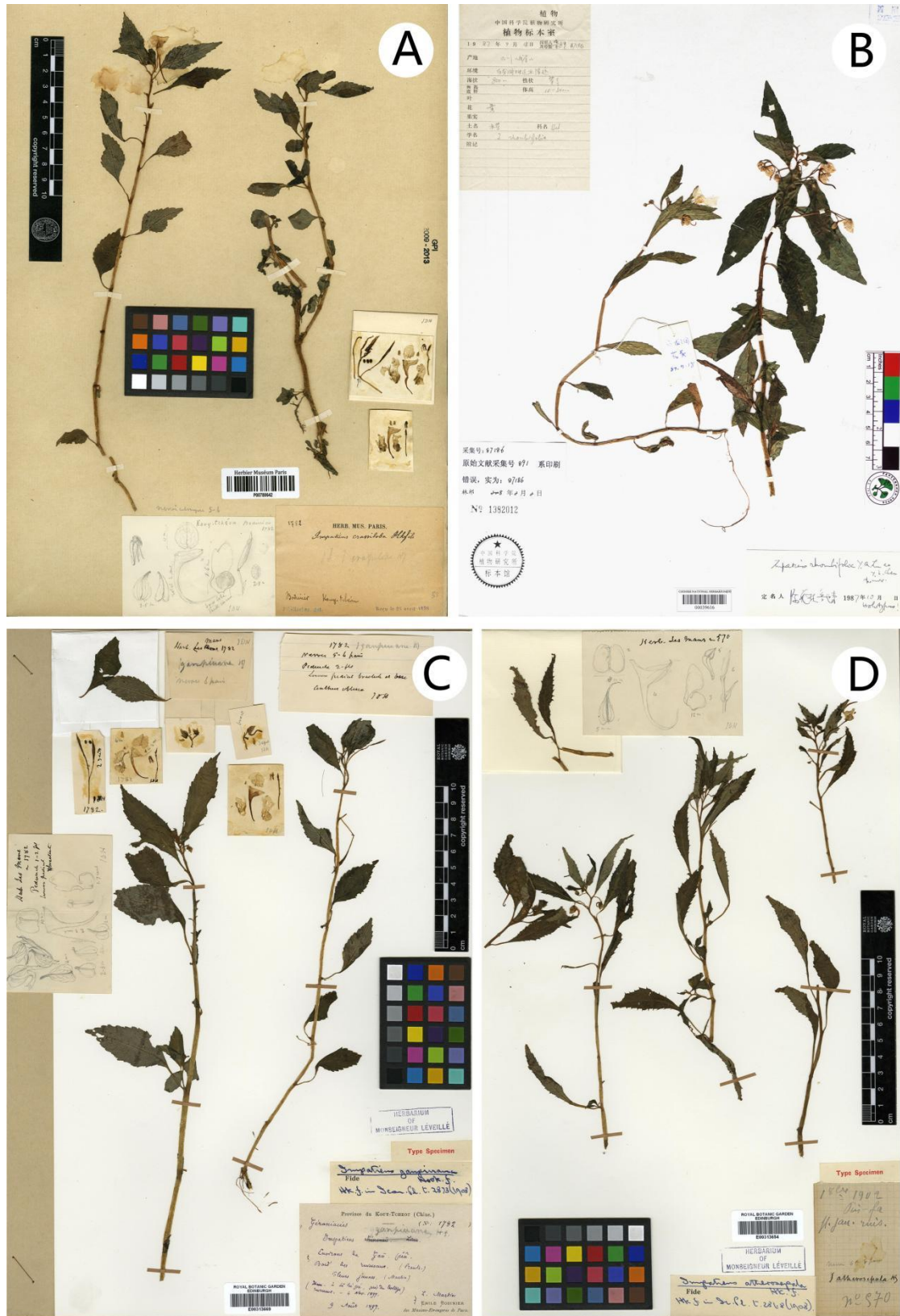
At the same time, we found that *Impatiens atherosepala* is relatively close to the above plants of genus *Impatiens*, the type locality actually being Pingfa, Guiding Country, which the *Flora of China* (Chen 2007) misquoted as Pingba. From the type specimen (Fig. 3.4-D), it can be seen that the typical features are leaves lanceolate, margin with spinescent-serrate, 1-flower and lateral sepals ovate, with long aristate. The population we found in Pingfa, Guiding County (Fig. 3.6-A-F) conformed to the description of these characters. Through a large number of field investigations, it was found that the leaf shape of genus *Impatiens* varied greatly and as a taxonomic character, it was not reliable. Meanwhile, the lateral sepals of *I. procumbens*, *I. reptans*, *I. crassiloba*, *I. ganpiuana*, *I. atherosepala* and *I. rhombifolia* had a tendency to extend and grow.

In addition, it can be seen from the type localities and other distribution points that the geographical distribution of these species is continuous and there is no obvious geographical isolation (Fig. 3.3).



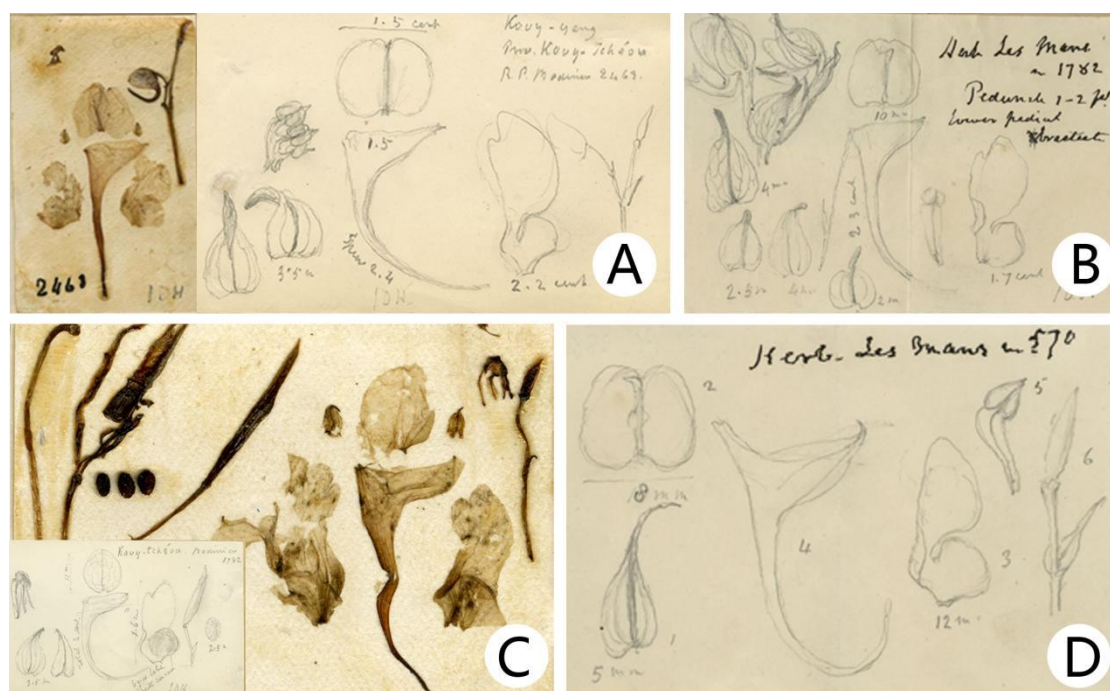
**Figure 3.3** Geographical distributions of *Impatiens procumbens*, *I. reptans*, *I. crassiloba*, *I. ganpiuana*, *I. atherosepala* and *I. rhombifolia*.

It can be seen that there is no obvious difference in the morphology of the above six species and the geographical distribution is widespread. Since *Impatiens procumbens* is the earliest name published, we determined that *I. reptans*, *I. crassiloba*, *I. ganpiuana*, *I. atherosepala* and *I. rhombifolia* are the synonyms of *I. procumbens*. Franch did not specify the type specimen when publishing the *I. procumbens*. Four specimens (collection no. 1949, collected by M. l'Abb é Delavy) made of flowering plants collected on 16 November 1885 are now in P (P04543629, P04543628, P04543627, P04543626), of which specimen P04543626 (Figure 3.5-A) is more consistent with the information described in the protologue, and contains complete plant morphology, flower part and collection information. Therefore, P04543626 is designated as the lectotype here and P04543627, P04543628 and P04543629 are the isolectotypes.



**Figure 3.4 Type specimens.** A *Impatiens Crassiloba* (E. M. Bodinier 1782; P00780642). B *I. rhombifolia* (Lu YingQing 87186; PE00039616). C *I. ganpiuana* (E. M. Bodinier 1782 ; E00313669). D *I. atherosepala* (E. M. Bodinier 1782 ; E00313654).





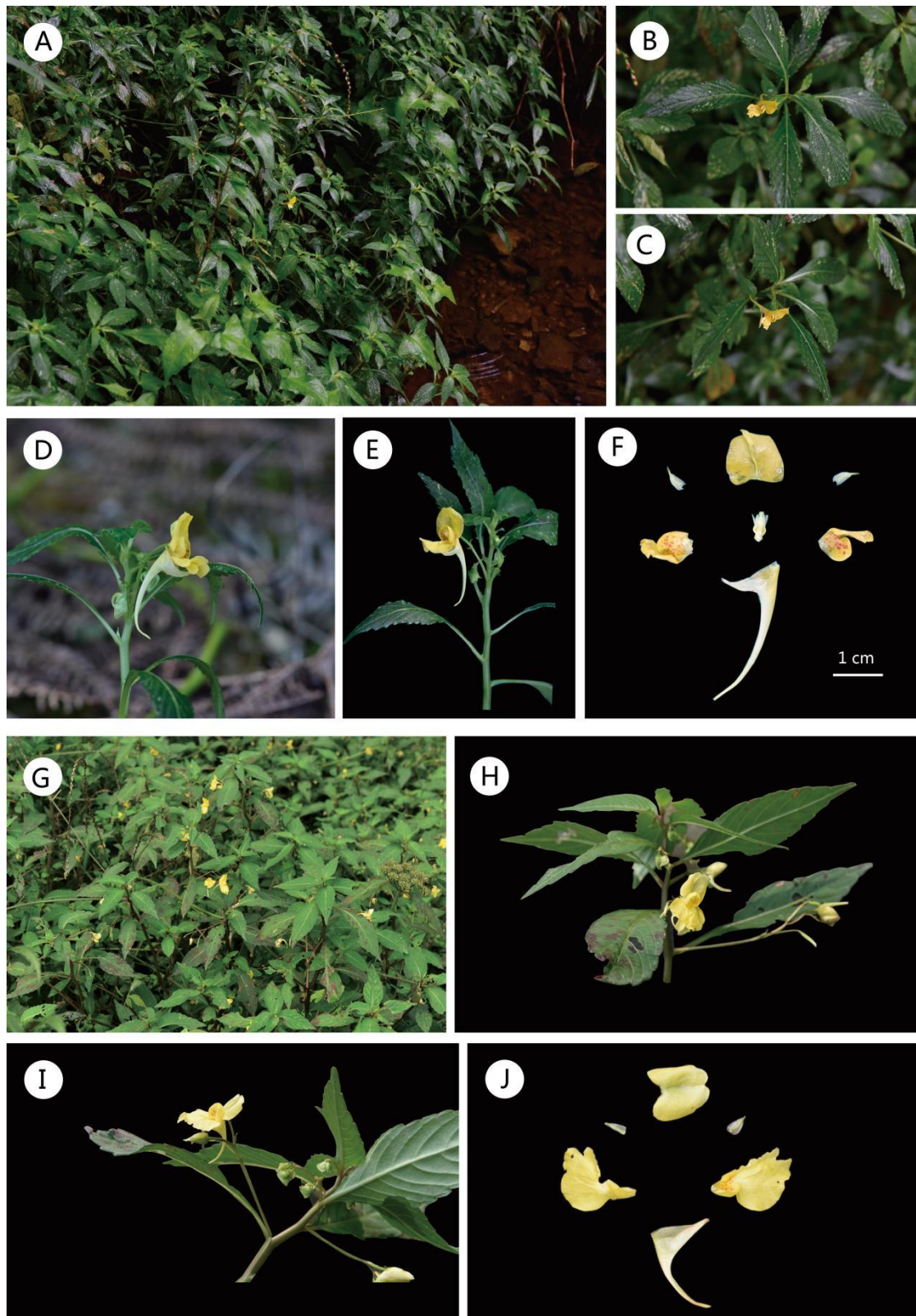
**Figure 3.5** Flower dissected and drawing. **A** *Impatiens reptans*. **B** *I. Crassiloba*. **C** *I. ganpiuana*. **D** *I. atherosepala*.

**Table 3.1** Comparison of morphological characters of *Impatiens procumbens*, *I. reptans*, *I. crassiloba*, *I. ganpiuana*, *I. atherosepala* and *I. rhombifolia*

Charact ers	<i>I. procumbens</i>	<i>I. reptans</i>	<i>I. crassiloba</i>	<i>I. ganpiuana</i>	<i>I. atherosepala</i>	<i>I. rhombifolia</i>
Stem	prostrate or procumbent	prostrate	prostrate	prostrate	no record	prostrate
Shape of leaf	ovate or ovate-lanceolat e, margin serrulate	ovate or ovate-elliptic, margin crenate-serrate or serrate	ovate, or ovate-lanceola te, margin coarsely serrate	elliptic, narrowly elliptic or lanceolate, margin coarsely serrate	lanceolate, margin spinescent-se rrate	rhombic or subrhombic, margin serrate
Lateral veins	5–6	6–7	6–8	4–6	6–8	5–6
Lateral sepal	obliquely ovate, subfalcate, 3-veined, apex long cuspidate	falcate-ovate, 3-veined, midvein apically stoutly mucronulate	lanceolate, small, 3-5-veined, apex cuspidate	ovate, abaxial midvein narrowly carinate	ovate, aristate, arista ca. as long as sepals, 3-veined	yellow-green, ovate-orbicula r, small, apex acute



Dorsal petal	orbicular, abaxial midvein thickened, narrowly carinate	orbicular, abaxial midvein fine, narrowly carinate;	orbicular, abaxial midvein carinate	elliptic, abaxial midvein rostellate, carinate	orbicular, abaxial midvein cristate	orbicular, large, abaxial midvein thickened
Lateral united petals	basal lobes subtetragonous, distal lobes obovate-oblong	basal lobes orbicular, small; distal lobes dolabriform	basal lobes orbicular, small; distal lobes large, apex 2-lobed	basal lobes broadly ovate; distal lobes dolabriform	basal lobes orbicular; distal lobes dolabriform, longer	basal lobes red spotted, orbicular, distal lobes dolabriform
Lower sepal	navicular, narrowed into an incurved spur	subnavicular, narrowed into an incurved spur, acute or divaricate	navicular, narrowed into a curved, long spur	funnelform, narrowed into an incurved spur	navicular, abruptly contracted into an incurved spur	navicular, narrowed into an erect spur; spur long
Anther	acute	acute	obtuse	obtuse	acute	acute



**Figure 3.6 (A-F) *Impatiens reptans*.** A Habit. B Flower in face view. C-E Flower in lateral view. F Flower dissected. **(G-J) *I. rhombifolia*.** G Habit. H Flower in face view. I Flower in lateral view. J Flower dissected. Photographs by XIN-XIANG BAI.

## Taxonomic treatment

***Impatiens procumbens*** Franch. in Bull. Soc. Bot. France 33: 447. 1886. (图. 4.1)

**Type.** CHINA. Yunnan: Dali City, 6 November 1885, *M. l'Abbé Delavy 1949* (lectotype here designated: P04543626; isoelectotype: P04543629, P04543628, P04543627).

=*Impatiens rhombifolia* Y. Q. Lu & Y. L. Chen **syn. nov.** Type:—CHINA. Guizhou: Mt. Omei, 18 September 1987, *Yingqing Lu 87186* (holotype: PE00039616)

=*Impatiens reptans* Hook. f., **syn. nov.** Type:—CHINA. Guizhou: Guiyang, 11 September 1898, *E. M. Bodinier 2463* (syntype: P00780766, E00313595)

=*Impatiens crassiloba* Hook. f., **syn. nov.** Type:—CHINA. Guizhou: Without locality, without date, *E. M. Bodinier 1782* (holotype: P00780642)

=*Impatiens ganpiuana* Hook. f., **syn. nov.** Type:—CHINA. Guizhou: Pinfa, 09 August 1897, *E. M. Bodinier & L. Martin 2463* (holotype: E00313669)

=*Impatiens atherosepala* Hook. f., **syn. nov.** Type:—CHINA. Guizhou: Pinfa, 01 October 1902, *J. P. Cavalerie & J. Pierre 570* (holotype: E00313654)

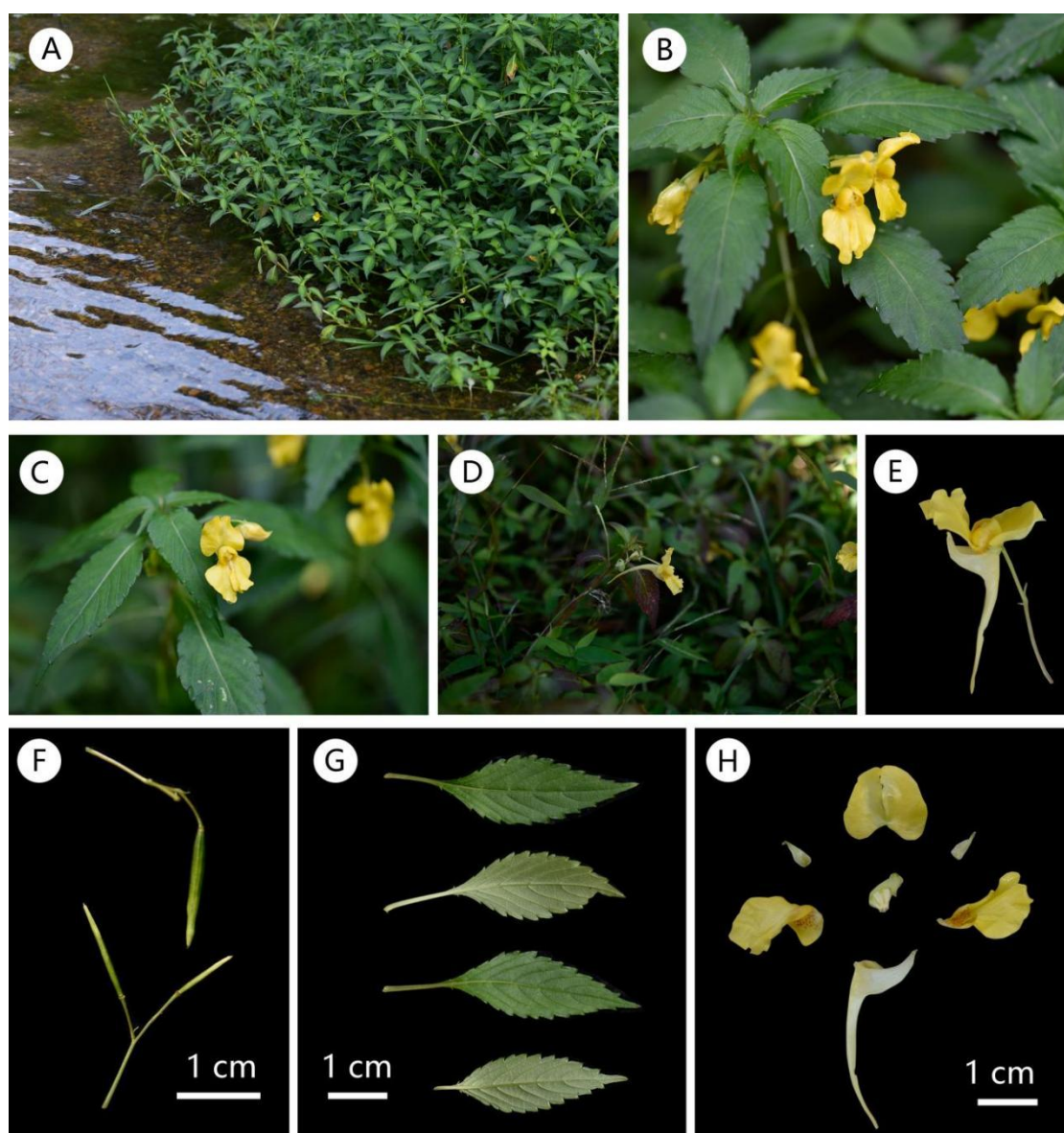
**Revised description.** Annual herbs, glabrous, 30–65 cm tall. Stem long prostrate basally, lower nodes with adventitious roots. Leaves alternate, lamina 4–7 × 1–4 cm, lanceolate to ovate or ovate-elliptic, apex acuminate, margin crenate-serrate or spinescent-serrate, apex acuminate, base cuneate, lateral veins 6–9 pairs. Inflorescences axillary, 18–3 mm long, 1–3-flowered, bracteate base or above middle; bract 1, small, persistent, ovate-lanceolate, ca. 3 × 1.5 cm. Flower yellow, ca. 4 × 2.5 cm. Lateral sepals 2, obliquely ovate, 4–6 × 2–3 mm, abaxial mid-vein slightly thickened, green, 3-veined. Lower sepal cymbiform, 1–1.2 mm deep (including spur), mouth vertical, apex slightly acute, narrowed into a long spur, ca. 1.8 cm. Dorsal sepal orbicular, ca. 1 cm in diam., base cordate, apex retuse, abaxial midvein fine, narrowly carinate. Lateral united petals 2-lobed, not clawed, basal lobes small, orbicular, ca. 3 mm long, with red spots; distal lobes dolabriform, ca. 12 mm long, with dorsal inflexed auricle and notch in subapical portion on dorsal side. Filaments short, anther acute. Capsule linear, 1.5–3 cm long.

**Distribution and Habitat.** Yunnan; Sichuan; Guizhou; Guangxi. The species grows on damp ground near hills and streams in the understorey.

**Phenology.** Flowering and fruiting occur from July to November.

**Additional specimens.** CHINA. **Guizhou:** Guiyang City, *Yuanxin Xiong 86009* (PE); Zhenfeng County, *Tsiang 4512* (PE); Wangmo County, *Gongfan Wang 1-0142* (PE); Cengheng County, *Fengcai Wang* (PE); Renhuai City, *Lijiao Lou MT571* (ZY); Zhijin Country, *Fang Cheng 522425150910005LY* (GZTM). **Guangxi:** Nandan County, *Shengxiang Yu 3709* (PE). **Hunan:** *Daike Tian et al., LS-2677* (CSH). **Yunnan:** Dali City, *Qiwu Wang 63390* (PE); Luquan County, *Yongjie Guo 10CS1920* (KUN); Yangbi County, *Renchang Qin 25280* (KUN, PE); Weixin County, *Spice Plant Investigation Team 870552 & 870553* (KUN); Songming County, *Y.P.Chang 0130* (PE). **Sichuan:** Chengdu City, *C.Y.Wang 7469 & 7446* (PE); *Wenpei Fang 13140 & 13701* (KUN); Emeishan City, *Jihua Xiong et al., 33487 & 33574* (IBK, PE); *Shengxiang Yu 3274* (PE); *Hsiung et al., 33574* (IBSC); *Xiaojie Li LiXJ175* (KUN); *Zhongwu Yao 3361* (PE); *Caiqi Li 3998* (PE); *Sichuan Plants, Western Academy of Sciences 891* (PE); *Gensheng Zhou 81205* (PE); *Zhengyi Wu 6439* (KUN); *T.N.Liou & C.Wang 797* (PE); *Cehong Li 96-39* (PE); *Chenglie Zhou 7267* (PE); Mabian Country, *Dejun Yu 4176 & 4175* (PE); *Deyuan Hong et al., s.n.* (PE); Dujiangyan City, *Wenpei Fang 6046* (PE).





**Figure 4.1** *Impatiens procumbens*. **A** Habit. **B** plant. **C** Flower in face view. **D-E** Flower in lateral view. **F** Seed.

**G** Leaf. **H** Flower dissected. Photographs by XIN-XIANG BAI.

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