

## Systematic Studies of Asian *Saussurea* (Asteraceae) I. *Saussurea kubotae*, a New Species from Western Japan

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A new species of *Saussurea* (Asteraceae), *S. kubotae* Kadota, is described from the Taishaku-dai limestone area, Hiroshima Prefecture, western Japan. *Saussurea kubotae* is morphologically similar to *S. tanakae* Franch. & Sav. ex Maxim., however, the former is different from the latter by having 13-seriate involucre phyllaries, a loose terminal raceme with longer, divaricate, scaly peduncles, obovoid involucre, sagittate lower cauline leaves, longer anthers and larger achenes. Sympatric occurrence of *S. kubotae* and *S. tanakae* was observed in the Taishaku-dai limestone area but any intermediate forms between the species were not found.

**Key words:** Japan, limestone area, new species, *Saussurea kubotae*, Taishaku-dai.

This article is a revisional work of Asian *Saussurea* (Asteraceae) (Kadota 1987, 2004).

In September of 2005 several living plants were sent to me by Dr. Masahiko Kubota who has studied the flora of Taishaku-dai (a limestone area), Hiroshima Prefecture, western Japan. Among them an unfamiliar plant of *Saussurea* (Asteraceae) was included. This plant agreed well with the illustration of “*Saussurea tanakae* Franch. & Sav.” by Mr. K. Inami (Inami 1988; pl. VI-100). *Saussurea tanakae* is mainly distributed in Kanto and Chubu Districts, central Honshu, Japan (Kitamura 1937, 1980, 1981, Koyama 1995, Ohwi 1953, 1972, Ohwi (Kitagawa) 1992, Ono et al. 1989) and is significantly different from the plant in question by having 9-seriate involucre phyllaries, campanulate involucre and cordate leaf blades. It was considered that the plant probably belongs to an undescribed species. Consequently I asked Dr. Kubota to collect

more materials of this *Saussurea* plant and send them to me. He made field examinations again in the Taishaku-dai limestone area in October and November of 2005 and sent me some living material. However, those plants unexpectedly corresponded to true *S. tanakae*. Consequently it was supposed that the undescribed species grew sympatrically with *S. tanakae* in the Taishaku-dai limestone area.

In October, 2006 I conducted field research in the area under the guidance of Dr. M. Kubota. As a result the sympatric occurrence of the undescribed *Saussurea* species and *S. tanakae* was confirmed. And it was clarified that the undescribed species is clearly distinguished from *S. tanakae* by the morphological characters stated below. Here I describe the species as *S. kubotae* after Dr. M. Kubota, who gave me a chance to study the species in detail.



Fig. 1. Holotype specimen of *Saussurea kubotae* Kadota (JAPAN: Honshu, Hiroshima Pref., Shōbara-shi, Tōjō-cho, Taishaku Uyama, alt. 460 m, 11 October 2006, Y. Kadota 067101, TNS 761280).

### Taxonomic treatment

**Saussurea** DC. in Ann. Mus. Natl. Hist. Nat. Paris **16**: 156, 198 (1810); Prodr. **VI**: 531 (1837).

Subgen. **Saussurea**: Lipsch., Fl. URSS **27**: 392 (1962); Gen. *Saussurea* 95 (1979) – H. Koyama in K. Iwats. & al., Fl. Jap. **3a**: 153 (1995) – C. Shih & S.-Y. Jing in Y. L. Chen & C. Shih, Fl. Reipub. Popul. Sin. **78**(2): 66 (1999).

Sect. **Saussurea**: Lipsch., Gen. *Saussurea* 178 (1979) – H. Koyama in K. Iwats. & al., Fl. Jap. **3a**: 153 (1995) – C. Shih & S.-Y. Jing in Y. L. Chen & C. Shih, Fl. Reipub. Popul. Sin. **78**(2): 158 (1999).

Ser. **Imbricatae** Kitam. in Acta Phytotax. Geobot. **4**: 11 (1935), p. p.; in Mem. Coll. Sci., Kyoto Imp. Univ., ser. B, **13**: (Compos. Jap. I) 198 (1937), p. p.

**Saussurea kubotae** Kadota, sp. nov.

[Figs. 1–3]

*Saussurea tanakae* auct. non Franch. & Sav. ex Maxim.: Inami, Illust. IV Select. Pl. Hiroshima Pref., pl. IV-100 (1988) – Miyajima Nat. Bot. Gard., Hiroshima Univ. & Hiba Soc. Nat. Hist., Fl. Hiroshima Pref. 438 (1997) – Hiroshima Pref., Red Data Book Hiroshima 2003 235 (2004).

Differt a *Saussurea tanakae* phyllariis 13-seriatis, pedunculis longioribus divaricatis bracteatis, foliis caulorum inferiorum sagittatis, involucris obovoideis, antheris longioribus et acheniis amplioribus.

**TYPE**: JAPAN: Honshu, Hiroshima Pref., Shôbara-shi, Tôjô-cho, Taishaku Uyama, alt. 460 m, 11 October 2006, Y. Kadota 067101 (TNS 761280–holotype, Fig. 1; TNS 76281–76284–isotype).

A robust, herbaceous perennial, 90–160 cm tall. Rhizome horizontal, ca. 1.5 cm in diameter, with string-like roots. Stem erect, striate, strongly winged, arachnoid in the upper part, simple or sometimes 2–3 times branched; wings up to 7 mm wide. Basal leaves withering at anthesis. Lower cauline

leaves subcoriaceous, sagittate, 11–22 cm long, 9.5–12 cm wide, coarsely dentate, glabrous on the adaxial side, sparingly arachnoid on veins on the abaxial side, deeply to shallowly cordate at base, acute at apex; petioles 11–26 cm long, sparingly arachnoid. Upper cauline leaves ovate to elliptic, 5–12 cm long, 3–6.5 cm wide, serrate, truncate to cuneate at base, acute at apex, similarly pubescent to the lower cauline leaves, shortly petiolate to sessile and amplexicaul. Flowers in September to October, with 3–8 capitula, arranged in a loose raceme; peduncles 2–7 mm long in the terminal raceme, divaricate, narrowly winged, sparingly arachnoid. Involucres obovoid, 14–18 mm in diameter, ca. 2 cm long, arachnoid and densely pubescent with adpressed hairs; phyllaries 13-seriate; outer phyllaries broadly ovate to ovate, 2–3 mm long, mucronate; inner phyllaries lanceolate, 14 mm long, acuminate; setae 8 mm long. Corollae purplish violet, 13–14 mm long; lobes 3–4.5 mm long; throats 2.5–4 mm long; tubes 5–6 mm long, longer than the throats; anthers 6.5–7 mm long, purplish black. Pappi 11–12 mm long, shorter than the corollae, grayish white. Achenes 6–7 mm long, glabrous, straw-colored, dark purplish-striate.

Japanese name: Taishaku-tôhiren (nom. nov.).

Distribution: Taishaku-dai, Hiroshima Pref., Honshu, Japan (endemic).

Images available on the web sites: [http://sya.sakura.ne.jp/web/toku/slidegally18/IMG\\_2512.JPG,-sllidegally20/IMG\\_5971.JPG,-sllidegally20/IMG\\_5977.JPG](http://sya.sakura.ne.jp/web/toku/slidegally18/IMG_2512.JPG,-sllidegally20/IMG_5971.JPG,-sllidegally20/IMG_5977.JPG).

Other specimens examined: JAPAN: Honshu, Hiroshima Pref., Shôbara-shi, Tôjô-cho, Taishaku Uyama, 23 Sept. 2005, M. Kubota 05312 (TNS 753088); Taishaku Uyama, 31 Oct. 2005, M. Kubota s. n. (TNS); Taishaku Uyama, 3 Nov. 2005, M. Kubota s. n. (TNS 755801, 755803).

*Saussurea kubotae* resembles *S. tanakae* in having a winged stem (Fig. 2) and imbric-



Fig. 2. Comparison between *Saussurea kubotae* (A) and *S. tanakae* (B) in habit. Both taken from Taishaku Uyama, Tôjô-cho, Shôbara-shi, Hiroshima Pref., Japan on 11 October 2006.

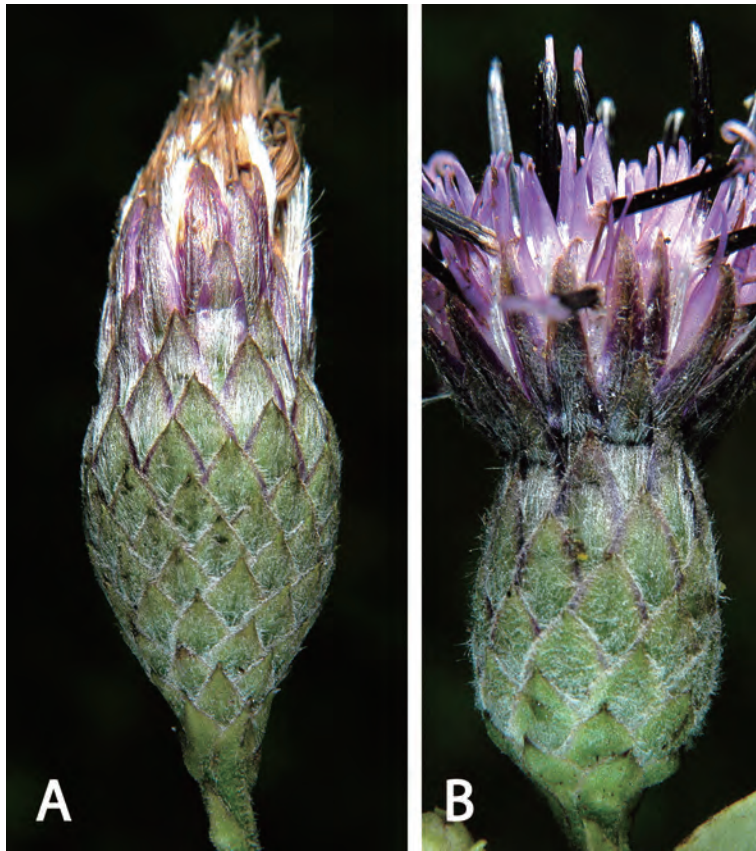


Fig. 3. Comparison between *Saussurea kubotae* (A) and *S. tanakae* (B) in involucre shape. Both taken from Taishaku Uyama, Tôjô-cho, Shôbarashi, Hiroshima Pref., Japan on 11 October 2006.

ate involucre phyllaries (Fig. 3). However, *S. kubotae* is clearly discriminated from *S. tanakae* by having 1) 13-seriate involucre phyllaries (Fig. 3A), 2) ovoid involucre (Fig. 3A), 3) a loose raceme with long, divaricate, scaly peduncles, 4) saggitate lower cauline leaves, 5) longer anthers and 6) larger achenes.

*Saussurea kubotae* was found growing on the margin of sparse *Pinus densiflora* woods together with *Cephalotaxus harringtonia*, *Aconitum japonicum* subsp. *napiforme*, *Lindera umbellata*, *Rubus crataegifolius*, *Kerria japonica*, *Acer crataegifolium*, *Staphylea bumalda*, *Aster scaber*, and so on.

In the Taishaku-dai limestone area *S. kubotae* grew sympatrically with *S. tanakae*. As any intermediate forms were not found it was considered that natural hybridization between the two species did not occur. According to Dr. Kubota *S. kubotae* flowers in September while *S. tanakae* in October. The difference in the flowering period might prevent the occurrence of natural hybridization between them.

As stated above *S. tanakae* is chiefly distributed in Kanto and Chubu Districts, central Honshu (on the Pacific Ocean side) and is rather common within the range. It is known that this species is also distributed in

Okayama Pref., western Japan (Kitamura 1937, 1981, Ono et al. 1989, Koyama 1995). The record of *S. tanakae* for Okayama Prefecture was based on the collection from the southern foot of Mt. Hiruzen (Prov. Mimasaka: Yatsuka [currently Okayama Pref., Maniwa-shi], Nakafukuda, 10 Oct. 1930, T. Tomogane, KYO; Kitamura 1937). A specimen collected by the same collector at the same locality on another day is also kept in TNS ([JAPAN] Mimasaka, Maniwagun, Yastuka-mura, 20 Oct. 1935, T. Tomogane s. n., TNS 51630, annotated as *S. sakushinana* Koidz. [nom. nud.]). This specimen is certainly ascribed to *S. tanakae*. This locality in Okayama Prefecture is ca. 500 km distant from the main distribution range in central Honshu. Sympatric occurrence of *S. tanakae* and *S. kubotae* was also expected at the southern foot of Mt. Hiruzen, Okayama Prefecture, as in the case of Taishaku-dai, Hiroshima Prefecture. In October of 2006 Dr. Kubota and I made a field examination at the foot Mt. Hiruzen and found several plants of *S. tanakae* on the margin of warm-temperate woods (alt. 520 m). However, no plants of *S. kubotae* were found.

I would like to show my sincere thanks to Dr. Masahiko Kubota for his presents of living materials and photographs of *S. kubotae* and guidance to Taishaku-dai and Mt. Hiruzen; to Dr. Hidetoshi Nagamasu, University Museum, Kyoto University, for his kind information on *Saussurea*; to Ms. Junko Makino for her presenting of living materials and photographs of *S. tanakae*.

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門田裕一：アジア産トウヒレン属（キク科）の分類学的研究 I. 広島県帝釈台産の 1 新種，タイシャクトウヒレン

広島県庄原市東城町の帝釈台（石灰岩地）から 1 新種タイシャクトウヒレン *Saussurea kubotae* Kadota を記載した。タイシャクトウヒレンは茎に翼（ヒレ）があり（Figs. 1-2），総苞片が圧着する（Fig. 3）点でセイトカトウヒレンに似ているが，総苞片が13列と多く，頭花の柄がより長くやや開出気味に伸びるので総状花序が疎らに見え（Fig. 2），一見して異なることが分かる。その他にタイシャクトウヒレンはセイトカトウヒレンと次のような特徴で区別される：①総苞は倒卵形で長さ約 2 cm，②下部の茎葉が矛形になること，③頭花の柄には小型の苞葉が多数着き，④葯は長

さ6.5-7 mm，⑤瘦果は長さ6-7 mmである。タイシャクトウヒレンでは茎の翼がさらに著しく，茎の下部では幅 5 mm に達するほか，総梗にも翼が発達する。また，茎葉の鋸歯もより低平である。

広島県帝釈台ではタイシャクトウヒレンとセイトカトウヒレンの 2 種が同所的に生育することが明らかになった。この 2 種は花期がずれており（タイシャクトウヒレンの方が早い），両種の間型が見いだされなかったので種間の交雑は起こっていないらしい。岡山県真庭市の蒜山南麓にもセイトカトウヒレンが知られているが，ここにはセイトカトウヒレンのみが見いだされた。

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