

Taxonomic Studies of *Cirsium* (Asteraceae) in Japan XVIII. A New Subsection and Four New Species from Kyushu, Southern Japan

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Abstract A new subsection and four new species of *Cirsium* are described from Kyushu, southern Japan. Subsect. *Tsukushicola*, subsect. nov. (sect. *Onotrophe* DC.) is characterized by the presence of basal leaves at anthesis, large-sized, nodding heads and the chromosome number of $2n = 4x = 68$. This new subsection is composed of three new species: *C. kirishimense* from southern Kyushu is characterized by deeply pinnatilobate leaves, 8–9-seriate involucrell phyllaries and longer outer phyllaries, *C. kjuense* from central Kyushu is characterized by (9–)10–11-seriate phyllaries and gynodioecy and *C. unzenense* from northern Kyushu is characterized by shallowly pinnatilobate leaves, 8–9-seriate involucrell phyllaries and shorter outer phyllaries. Additionally *C. akimotoi* is described from Mt. Shiraiwa-yama, Miyazaki Pref., central Kyushu. *C. akimotoi* belongs to another subsection, subsect. *Suffulta*, and is distinguished from *C. pseudosuffultum* Kadota by deeply pinnatilobate, cauline leaf lobes ascending at an acute angle, larger capitula, longer, spreading (patent) to ascending involucrell phyllaries, shorter achenes and linear, vestigial glandular bodies.

Key words: *Cirsium akimotoi*, *Cirsium kirishimense*, *Cirsium kjuense*, *Cirsium unzenense*, Kyushu, new subsection, new species, subsect. *Tsukushicola*.

Introduction

Since 1998 I have studied *Cirsium* plants from Kyushu Island, southern Japan, as part of a systematic study of the genus *Cirsium* (Kadota, 1989–2007; Kadota and Nagase, 1988). Among the species of the genus *Cirsium suffultum* (Maxim.) Matsum. et Koidz. [basionym: *Cnicus suffultus* Maxim.] was also most questionable species in Kyushu because this species is most common and highly variable in morphological attributes. Most Japanese authors considered that this species was distributed throughout the Kyushu Island (e.g., Nakai, 1912; Kitamura, 1934, 1937, 1957, 1981; Hara, 1952; Ohwi, 1953, 1965, 1984; Ohwi (Kitagawa), 1983; Masamune, 1974; Sugimoto, 1978). It has been clarified that the photograph appeared as “*Cirsium suffultum*” in *Wild Flowers of Japan, Vol. III*

(Satake *et al.*, 1981; pl. 200, photos 1–2), a current representative of the Japanese floras, does not correspond to true *C. suffultum* but to another distinct taxon (Kadota, unpublished; cf. Watanabe and Imae, 1976). These facts suggest that *C. suffultum* has not been thoroughly understood. Accordingly field and herbarium examinations were executed in order to clarify the entity of *C. suffultum*.

Later the lectotypification of *Cirsium suffultum* was done (Kadota, 1993) and a new subsection of sect. *Onotrophe*, subsect. *Suffulta* Kadota, was established (Kadota, 2006). Subsect. *Suffulta* from Kyushu Island has been proved to be composed of three species, *C. chikushiense* Koidz. (1919) and *C. masami-saitonum* Kadota as well as *C. suffultum* (Kadota, 2006). Subsect. *Suffulta* is defined as the *Cirsium* plants characterized by the absence of basal (radical) leaves at anthesis,

nodding, large-sized heads and the chromosome number of $2n = 4x = 68$.

In October 2003 a field examination was done in Mt. Wanitsuka-yama, the Minami-Naka (Nichinan) Mountains, Miyazaki Prefecture, Kyushu, under the guidance of Mr. M. Saito, Head Curator of Miyazaki Prefectural Museum. Unknown thistles were found abundantly in the zone of the elevation higher than 1000 m (the montane zone = the *Fagus crenata* zone). Another thistle, *C. masami-saitoanum* (subsect. *Suffulta*), commonly grew in the basal zone of the mountain. The thistle at issue is similar to *C. masami-saitoanum* in having large nodding heads and the chromosome number of $2n = 4x = 68$ but is distinguished from the latter by the presence of basal leaves at anthesis. The species growing in the upper zone of Mt. Wanitsuka-yama were later found in Mt. Takakuma-yama (Kagoshima Pref.) and the Kirishima Mountains on the border between Miyazaki and Kagoshima Prefectures and is proved to belong to a new species. This new species is here described as *C. kirishimense* due to the occurrence of large populations in the Kirishima Mountains. *Cirsium kirishimense* is thus distributed in southern part of Kyushu Island and grows in meadows and along the margin of summer-green woods.

Uncovering the occurrence of *C. kirishimense* in the temperate zone of southern mountains in Kyushu, field works were also made both in northern and central mountains of Kyushu. Two new entities were additionally found as a consequence of the works. They will be here described as *C. unzenense* and *C. kujunense*, respectively. A new subsection of sect. *Onotrophe* will be also described in this paper. The new subsection consists of the above stated three species; *C. kirishimense*, *C. kujunense* and *C. unzenense*.

In July 2008 a field survey of *Astilbe* (Saxifragaceae) was conducted in Mt. Shiraiwa-yama, the Kittachigoshi Mountains, the Kyushu Mountain Range, Miyazaki Pref. At that time I encountered curious thistles in the summit area of the mountain (a calcareous area). Unfortunately it was too early for the thistles to flower. However,

the thistles are clearly characterized by the absence of basal leave before anthesis. The *Cirsium* flora of the area surrounding Mt. Shiraiwa-yama and its neighboring region has been already examined. And it is confirmed that only *C. suffultum* occurs abundantly in the basal zone of the mountain. However, thistles were hardly known in the montane zone of the mountain. Consequently I re-examined *Cirsium* in the summit area of the mountain in October 2008. Then it is turned out that this thistle belongs to an undescribed species within the subsect. *Suffulta*. This thistle will be also described as a new species, *C. akimotoi*, in this paper.

Taxonomic treatment

Genus *Cirsium* Mill., Gard. Dict. Abringd. ed. 4, 1 (1754), emend. Scop., Fl. Carn. 355 (1760).

Sect. **Onotrophe** (Cass.) DC., Prodr. 6: 644 (1837).

Genus *Onotrophe* Cass. in Dict. Sci. Nat. 36: 145 (1825).

Ser. *Onotrophe* (Cass.) Maxim. in Bull. Acad. Sci. St.-Petersb. 19: 502 (1874).

Subsect. **Tsukushicola** Kadota, subsect. nov.

Herba perennis, hermaphroditia vel gynodioecia, radice verticali vel obliquo, foliis basalibus emaricidis sub anthesin, eis caulinis remotis, capitulis nutantibus, involucris campanulatis vel cylindricis, foliis subtensis prulibus foliaceis, numero chromosomatibus $2n = 4x = 68$.

TYPE. *Cirsium kirishimense* Kadota et Masami Saito (see below).

Hermaphrodite or gynodioecious, perennial herbs. Root stock vertical to oblique. Basal leaves persistent at anthesis. Cauline leaves remote. Capitula campanulate to cylindrical, nodding; subtending leaves several, foliaceous. Chromosome number $2n = 4x = 68$.

1. ***Cirsium kirishimense*** Kadota et Masami Saito, sp. nov. [Figs. 1–2]

Herba hermaphrodita perennis herbacea 0.5–1.2 m alta. Radix crassa verticalis vel obliqua usque ad 1.5 cm diametro, radicellis incrassatis



Fig. 1. Habit of *Cirsium kirishimense* Kadota et Masami Saito (Ebino Plateaus, the Kirishima Mountains, Ebino-shi, Miyazaki Pref., Kyushu, alt. 1180 m, on 21 October 2007). Left corner inset shows a capitulum (actually nodding).

40 cm longis. Caulis suberectus sulcatus superne ramosus arachnoideus et brunnea-pubescentis, ramis elongatis. Folia basalia coriacea persistentia sub anthesin rosularia, laminis ovatis vel anguste ovatis 26–49 cm longis 14–24 cm latis utrinque glabra profunde vel leniter pinnatilobatis, breviter petiolatis, lobis 5–9-jugatis anguste ovatis 5–14 cm longis 1.5–6 cm latis divaricatis, spinis validis 1–5 mm longis. Folia caulina laneolata sessilia amplexicaulia. Flores in Septembris vel Octobris. Capitula 2–3, nutantia, pedunculatis 1–4 cm longis, foliis subtentis anguste ellipticis et foliaceis vel lanceolatis 0.5–7 cm longis, valde spinis usque ad 1 cm longis. Involucra campanulata vel cylindrica eglutinosa 19–23 mm longa 12–18 mm (*in vivo*) et 2–3 cm (*in sicco*) in diametro parce arachnoidea. Phyllaria involucrorum 8–9-seriata subcoriacea, spinis ca. 1 mm longis, phyllariis intimis late linearibus ca. 20 mm longis erectis, eis extermis anguste ovatis ascendentibus vel recurvatis 10–12 mm longis, vitis linearibus vestigialibus. Corollae dilute violacea 19–20 mm longa, lobis 4–5 mm longis, faucibus 5–6 mm longis, tubis ca. 9 mm longis. Achenia purpureocinereobrunnea ca. 4.5 mm longa subtiliter striata garadiatim angustata, pappi sordidis 10–18 mm longis.

TYPE. JAPAN: KYUSHU; Miyazaki Pref., Ebino-shi, the Kirishima Mountains, Ebino Plateaus, 31°56'38"N 130°50'24"E, alt. 1180 m, 21 October 2007, Y. Kadota 077101 (TNS 770824–holotype; Fig. 2).

A hermaphrodite, perennial, herbaceous plant, 0.5–1.2 m high. Root stock firm, vertical to oblique, up to 1.5 cm in diameter, with cord-like roots; roots up to 40 cm long or longer. Stem suberect, sulcate, 1–6 times branched in the upper part, arachnoid and covered with brownish hairs in the upper part; branches elongated at an acute angle. Basal leaves deep green, coriaceous, persistent at anthesis and rosulate; blades ovate to narrowly ovate in outline, 26–49 cm long, 9–27 cm wide, almost glabrous on both sides, deeply or sometimes medially pinnatilobate, with petioles ca. 1 cm long, amplexicaul; lobes 5–9-jugate, narrowly ovate, 5–14 cm long, 1.5–6 cm

wide, divaricate, with sharp spines 1–5 mm long. Cauline leaves several, lanceolate and smaller than the basal, diminishing in size, almost glabrous on both sides, sessile, amplexicaul. Flowers in September to October. Capitula nodding, 2–3 in a loose corymb, pedunculate; peduncles 1–4 cm long, densely arachnoid; subtending leaves several, narrowly elliptic and foliaceous to lanceolate, 0.5–7 cm long, provided with sharp spines up to 1 cm long. Involucres campanulate to cylindrical, eglutinous, 19–23 mm long, 12–18 mm (*in vivo*) and 2–3 cm (*in sicco*) in diameter, sparingly arachnoid. Phyllaries 8–9-seriate, subcoriaceous, terminated with sharp spines ca. 1 mm long; innermost phyllaries broadly linear, ca. 20 mm long, erect; outer phyllaries narrowly ovate with ascending to recurved, 10–12 mm long, shorter than the inner ones; glandular bodies linear on the inner phyllaries, vestigial. Corollae pale violet, 19–20 mm long; lobes 4–5 mm long; throats 5–6 mm long; tubes ca. 9 mm long, longer than the throats. Achenes purplish brown-gray, ca. 4.5 mm long, ribbed, finely striate, tapered to the base; pappi sordid, 10–18 mm long.

Chromosome number: $2n = 4x = 68$.

Distribution: Southern Kyushu (the Kirishima Mountains, Mts. Wanitsuka-yama and Takakuma-yama, Miyazaki and Kagoshima Prefs.; Fig. 9A, triangle). Endemic to Japan.

Japanese name: Kirishima-azami (nom. nov.).

Additional specimens examined: JAPAN: KYUSHU; **Miyazaki Pref.**, Miyazaki-gun, Tanocho, Mt. Wanitsuka-yama, alt. 1000 m, 28 Oct. 2003, Y. Kadota 034901–034903 (TNS 727784–727788); Mt. Wanitsuka-yama, Plot B, 24 Oct. 2004, Y. Kadota 046012–046014 (TNS 744102–744106); Mt. Wanitsuka-yama, along montane summer-green woods, 31°46'04"N 131°16'19"E, alt. 780 m, 11 Oct. 2005, Y. Kadota 056211–056215 (TNS 753503–753505, 753556–753558); Mt. Wanitsuka-yama, alt. 1000 m, 11 Oct. 2005, Y. Kadota 056111–056114 (TNS 753559–753568). Ebino-shi, the Kirishima Mountains, Ebino Plateaus, alt. 1300 m, Y. Kadota 929111–929118 (TNS 9026767–9026777); Ebino Plateaus, Plot J, alt. 710 m, 27 Oct. 2004, Y.

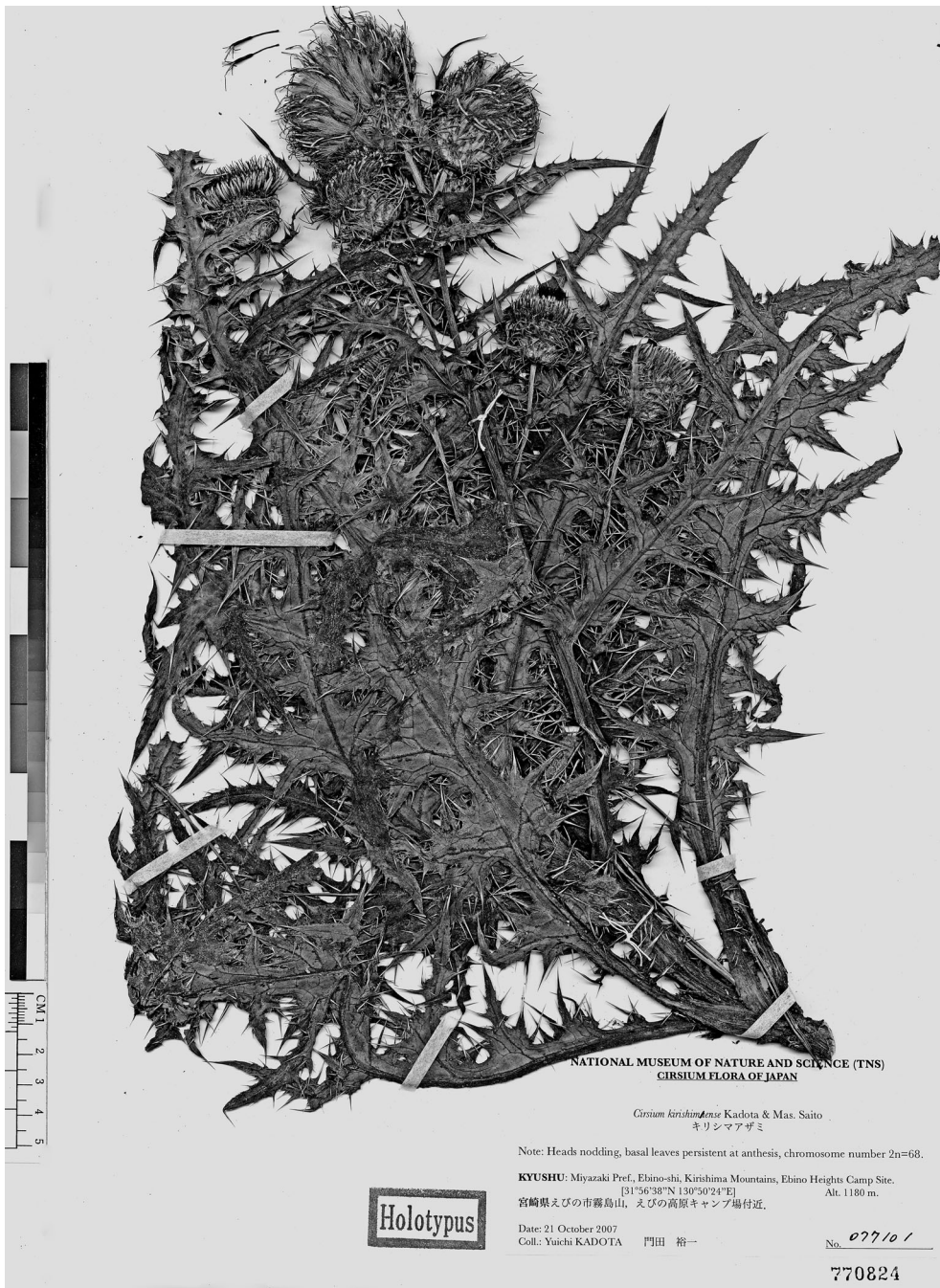


Fig. 2. Type specimen of *Cirsium kirishimense* Kadota et Masami Saito (JAPAN: KYUSHU; Miyazaki Pref., Ebino-shi, the Kirishima Mountains, Ebino Plateaus, 31°56'38"N 130°50'24"E, alt. 1180 m, 21 October 2007, Y. Kadota 077101, TNS 770824, holotype).

Kadota 046077 (TNS 733989); Ebino Plateaus, 31°56'38"N 130°50'24"E, alt. 1180 m, 21 Oct. 2007, Y. Kadota 077102–077108 (TNS 770815–770823, 770825–770826).

Kagoshima Pref., Aira-gun, Makizono-cho, the Kirishima Mountains, en route from Mt. Karakuni-dake to Ônami pond, 31°55'30–55"N 130°51'30"–52'00"E, alt. 1500–1600 m, 4 Sept. 2001, S. Fujii 8749 (TNS 722941–722942); Awano-cho, Ebino Plateaus, 3 Nov. 1999, K. Maruno 9911 (TNS 689451); on the border between Miyazaki and Kagoshima Prefs., Mt. Karakuni-dake, 25 Aug. 1980, J. Haginiwa 11048–11049 (TNS 961048–961049). Kanoyashi, the Takakuma Mountains, Mt. Ontake, 16 Oct. 1999, K. Maruno 9901–9909 (TNS 689452–689450); Mt. On-take, along a trail, 31°27'03"N 130°49'16"E, alt. 820 m, 15 Oct. 2005, Y. Kadota 056504–056506 (TNS 753444–753448).

2. *Cirsium kjuense* Kadota, sp. nov.

[Figs. 3–4]

Affinis *Cirsio kirishimense*, sed habiti gynodioecio, vitis liquidis linearibus super phyllariis involuorum intimis et mediis, phyllariis (9–)10–11-seriatis, acheniis pusillis differt.

TYPE. JAPAN: KYUSHU; Ôita Pref., Yufu-shi, Yufuin-cho, the Kujû Mountains, Mt. Tsurumi-dake, 33°16'32"N 131°26'03"E, alt. 870 m, 23 October 2007, Y. Kadota 077517 (TNS 770801–holotype; Fig. 4).

A gynodioecious, perennial, herbaceous plant, 0.3–1.8 m high. Root stock firm, vertical to oblique, up to 1.5 cm in diameter, with cord-like roots; roots up to 25 cm long or longer. Stem suberect, sulcate, 1–6 times branched in the upper part or sometimes simple, arachnoid and covered with brownish hairs in the upper part; branches elongated at an acute angle. Basal leaves deep green, coriaceous, persistent at anthesis and rosulate; blades ovate to narrowly ovate in outline, 20–49 cm long, 9–27 cm wide, almost glabrous on both sides, deeply or sometimes pinnatilobate, with petioles ca. 1 cm long, amplexicaul; lobes 5–10-jugate, narrowly ovate, 5–14 cm long, 1.5–6 cm wide, divaricate, with

sharp spines 1–5 mm long. Cauline leaves several, lanceolate and smaller than the basal, diminishing in size, almost glabrous on both sides, sessile, amplexicaul. Flowers in September to October. Capitula nodding, 2–3 in a loose corymb, pedunculate; peduncles 1–4 cm long, densely arachnoid; subtending leaves several, narrowly elliptic and foliaceous to lanceolate, 0.5–7 cm long, provided with sharp spines up to 1 cm long. Involucres campanulate to cylindrical, slightly glutinous, in hermaphrodite plant, 18–20 mm long, 12–14 mm (*in vivo*) and 2–3.5 cm (*in sicco*) in diameter, in female plant, 17–19 mm long, 8–12 mm (*in vivo*) and 1.5–2.5 cm (*in sicco*) in diameter, sparingly arachnoid. Phyllaries (9–)10–11-seriate, subcoriaceous, terminated with sharp spines ca. 1 mm long; innermost phyllaries broadly linear, ca. 20 mm long, erect; outer phyllaries narrowly ovate with ascending to recurved, 10–12 mm long, shorter than the inner ones; glandular bodies linear on the inner phyllaries. Corollae, in hermaphrodite plant, pale violet, 18–20 mm long; lobes 4–5 mm long; throats 5–6 mm long; tubes 8–10 mm long, clearly longer than the throats; in female plant, deep pink, 12–13 mm long; lobes 2–3 mm long; throats 4–5 mm long; tubes 5–6 mm long, slightly longer than the throats. Achenes purplish brown or often two-tone (i.e., straw-colored at the basal part), 4–4.5 mm long, ribbed, finely striate, tapered to the base; pappi sordid, in hermaphrodite plant, 13–17 mm long, in female plant, 10–12 mm long.

Chromosome number: $2n = 4x = 68$.

Distribution: Central Kyushu (the Kujû and Sobo Mountains, Ôita and Miyazaki Prefs.; Fig. 9A, disc). Endemic to Japan.

Japanese name: Kujû-azami (nom. nov.).

Additional specimens examined: JAPAN: KYUSHU; Ôita Pref., Mt. Yufu-dake, 25 Aug. 1916, Z. Tashiro s.n. (TNS 28320); Yufu-shi, Yufuin-cho, the Kujû Mountains, Mt. Tsurumi-dake, 33°16'32"N 131°26'03"E, alt. 870 m, 23 October 2007, Y. Kadota 077511–077516 (TNS 770802–770808). Beppu-shi, Minami-Tateishi, Mt. Tsurumi-dake, the summit area, 33°17'11.9"N 131°25'46.4"E, alt. 1374 m, 12 Oct.



Fig. 3. Habit of *Cirsium kjuense* Kadota (Mt. Tsurumi-dake, the Kujū Mountains, Yufu-shi, Ôita Pref., Kyushu, alt. 870 m, on 23 October 2007). Left corner inset shows a capitulum (actually nodding).



Fig. 4. Type specimen of *Cirsium kujuense* Kadota (JAPAN: KYUSHU; Ôita Pref., Yufu-shi, Yufuin-cho, the Kujû Mountains, Mt. Tsurumi-dake, 33°16'32"N 131°26'03"E, alt. 870 m, 23 October 2007, Y. Kadota 077517, TNS 770801, holotype).

2008, Y. Kadota 088052–088059 (TNS 777123–777133). Taketa-shi, Kujū-cho, Sora, Mt. Daisen-zan, 33°04'46.6"N 131°17'58.6"E, alt. 1045 m, 10 Oct. 2008, Y. Kadota 088022–088025 (TNS 777105–777109).

Miyazaki Pref., Nishi-Usuki-gun, Takachiho-cho, Mt. Sobo-san, Kumini-tôge Pass, alt. 1500 m, 25 Aug. 2007, M. Saito 15 (TNS 768381).

Cirsium kujuese is distinguished from *C. kirishimense* by having gynodioecious habit, clear (but eglutinous) glandular bodies on the inner and middle involucrel phyllaries, (9–)10–11-seriate phyllaries and smaller achenes.

Cirsium kujuese usually grows in grasslands of volcanic areas. Currently these grasslands have tended to be woodlands due to natural succession (cf., recent, fewer artificial burning of bushes and forests). The *Cirsium* plants will be covered by large grasses (e.g., *Miscanthus sinensis*) and bushes. They have therefore come to lose basal leaves in their habitats.

3. ***Cirsium unzenense*** Kadota et Masami Saito, sp. nov. [Figs. 5–6]

Differt ab *Cirsio kirishimense*, laminis foliorum basalibus non profunde pinnatilobatis, pylariis involucrelorum intemis brevis, acheniis pusillis; ab *C. kujuese*, phyllariis involucrelorum 8–9-seriatis, vitiis vestigialibus, habiti hermaphrodito.

TYPE. JAPAN: KYUSHU; Nagasaki Pref., Unzen-shi, Obama-cho, Unzen, the Unzen Mountains, Nita-tôge Pass, 32°45'01"N 130°17'01"E, alt. 1050 m, 25 October 2006, Y. Kadota 068121 (TNS 761340–holotype; Fig. 6).

A hermaphrodite, perennial, herbaceous plant, 0.3–1.5 m high. Root stock firm, vertical to oblique, up to 1.5 cm in diameter, with cord-like roots. Stem suberect, sulcate, 2–6 times branched in the upper part, arachnoid and covered with brownish hairs in the upper part; branches elongated at an acute angle. Basal leaves greyish green, coriaceous, persistent at anthesis and rosulate; blades ovate to narrowly ovate in outline, 27–60 cm long, 10–24 cm wide, almost glabrous on both sides, deeply or sometimes pinnatilobate, with petioles ca. 1 cm long, amplexicaul; lobes

6–8-jugate, narrowly ovate, 5–14 cm long, 1.5–6 cm wide, divaricate, with sharp spines 1–5 mm long. Cauline leaves several, lanceolate and smaller than the basal, diminishing in size, almost glabrous on both sides, sessile, amplexicaul. Flowers in September to October. Capitula nodding, 2–3 in a loose corymb, pedunculate; peduncles 1–4 cm long, densely arachnoid; subtending leaves several, narrowly elliptic and foliaceous to lanceolate, 0.5–7 cm long, provided with sharp spines up to 1 cm long. Involucres campanulate to cylindrical, eglutinous, 19–23 mm long, 12–18 mm (*in vivo*) and 2–3 cm (*in sicco*) in diameter, sparingly arachnoid. Phyllaries 8–9-seriate, subcoriaceous, terminated with sharp spines ca. 1 mm long; innermost phyllaries broadly linear, ca. 20 mm long, erect; outer phyllaries narrowly ovate with ascending to recurved tips, 10–12 mm long, shorter than the inner ones; glandular bodies linear on the inner phyllaries, vestigial. Corollae pale violet, 19–22 mm long; lobes 4–5 mm long; throats 6–7 mm long; tubes 8–11 mm long, longer than the throats. Achenes dark purplish brown, ca. 4 mm long, ribbed, finely striate, tapered to the base; pappi sordid, 14–17 mm long.

Chromosome number: $2n = 4x = 68$.

Distribution: Northern Kyushu (the Tara-dake and Unzen Mountains, Nagasaki Pref.; Fig. 9A, star). Endemic to Japan.

Japanese name: Unzen-azami (nom. nov.).

Additional specimens examined: JAPAN: KYUSHU; **Nagasaki Pref.**, Unzen-shi, Obama-cho, Unzen, the Unzen Mountains, Mt. Onsen-dake, 23 Sept. 1906, Z. Tashiro s.n. (TNS 30821); Unzen-shi, Obama-cho, Unzen, the Unzen Mountains, Mt. Myôken-dake, alt. 1200 m, 3 Nov. 2004, M. Iwamura 16559 (TNS 744162); Unzen-shi, Obama-cho, Unzen, the Unzen Mountains, Nita-tôge Pass, 32°45'01"N 130°17'01"E, alt. 1050 m, 25 Oct. 2006, Y. Kadota 068122–068130 (TNS 761341–761349); Unzen-shi, Obama-cho, Unzen, the Unzen Mountains, at the tunnel on the Route 389, 32°45'44"N 130°16'32"E, alt. 940 m, 25 Oct. 2006, Y. Kadota 068111–068115 (TNS 761334–



Fig. 5. Habit of *Cirsium unzenense* Kadota et Masami Saito (Nira-tôge Pass, the Unzen Mountains, Unzen-shi, Nagasaki Pref., Kyushu, alt. 1050 m, on 25 October 2006). Left corner inset shows a capitulum (actually nodding).

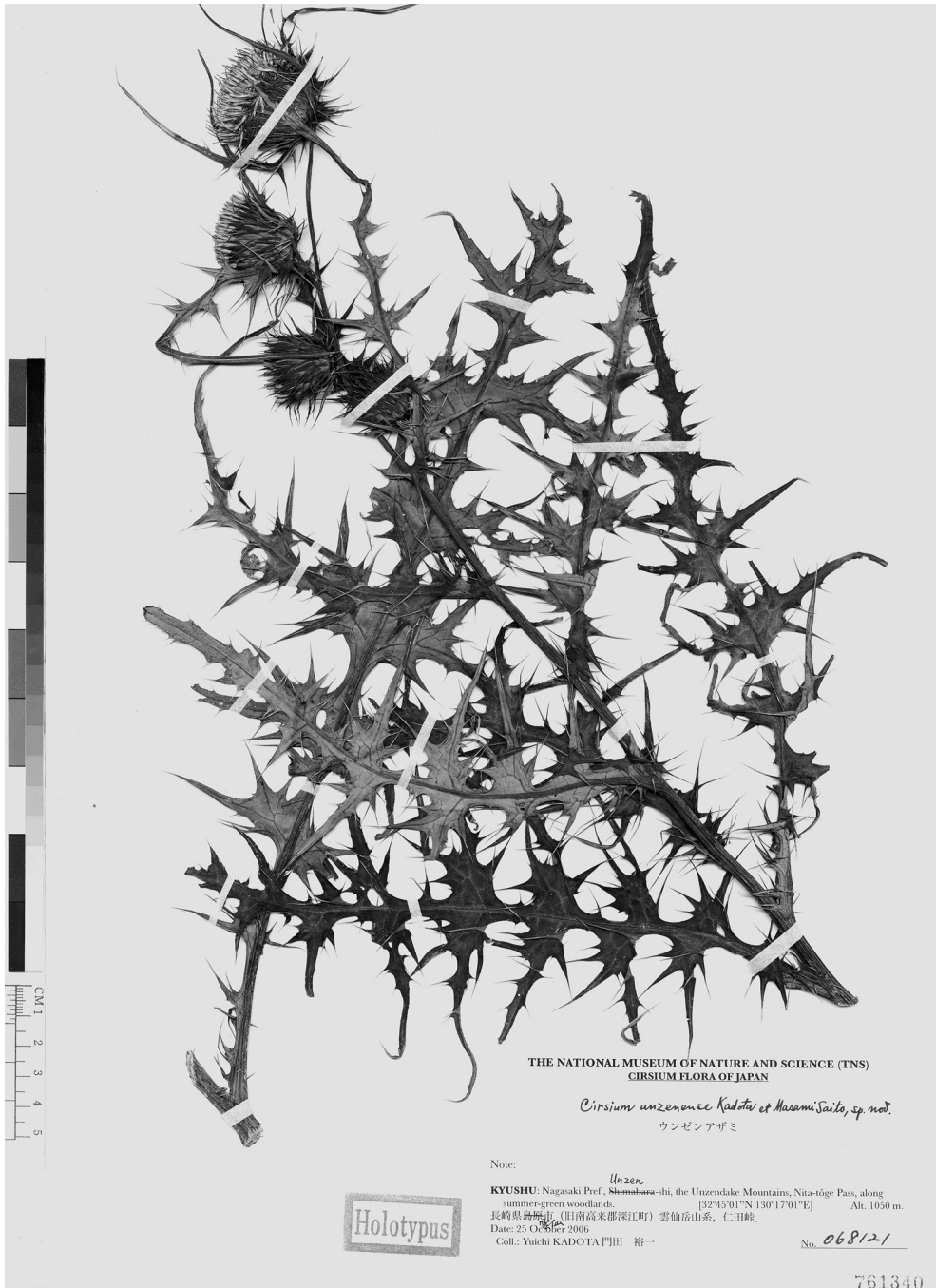


Fig. 6. Type specimen of *Cirsium unzenense* Kadota et Masami Saito (JAPAN: KYUSHU; Nagasaki Pref., Unzen-shi, Obama-cho, Unzen, the Unzen Mountains, Nita-tôge Pass, 32°45'01"N 130°17'01"E, alt. 1050 m, 25 October 2006, Y. Kadota 068121, TNS 761340, holotype).

761339). Isahaya-shi, Shirakimine-machi, the Tara-dake Mountains, Mt. Gokawara-dake, 32° 56' 43" N 130° 04' 34" E, alt. 745 m, 24 Oct. 2006, Y. Kadota 068101–068106 (TNS 761327–761333).

Cirsium unzenense is distinguished from *C. kirishimense* by having more shallowly divided leaf blades, shorter, outer involucrel phyllaries and smaller achenes, from *C. kujuese* by 8–9-seriate involucrel phyllaries, vestigial glandular bodies and hermaphrodite habit.

Key to the species of subsect. *Tsukushicola*

- 1A Plant gynodioecious; involucrel phyllaries (9–)10–11-seriate; glandular bodies clear on the inner and middle involucrel phyllaries; plants of central Kyushu
 *Cirsium kujuese*
- 1B Plant hermaphrodite; involucrel phyllaries 8–9-seriate; glandular bodies vestigial, unclear
- 2A Outer involucrel phyllaries longer than half of the inner ones; leaf blades deeply pinnatilobate; achense longer than 4.5 mm; plants of southern Kyushu.
 *Cirsium kirishimense*
- 2B Outer involucrel phyllaries shorter than half of the inner ones; leaf blades medially pinnatilobate; achense shorter than 4 mm; plants of northern Kyushu
 *Cirsium unzenense*

Subsect. **Suffulta** Kadota in Bull. Natn. Sci. Mus., Tokyo, Ser. B, **32**(2): 86 (2006).

Subsect. *Nipponocirsium* Kitam. in Acta Phytotax. Geobot. **3**: 4 (1934); in Mem. Coll. Sci. Kyoto Imper. Univ. ser. B, **13**: 106 [Compos. Jap. **1**: 106] (1937), p. p.

TYPE. *Cirsium suffultum* (Maxim.) Matsum. et Koidz.

4. ***Cirsium akimotoi*** Kadota et Masami Saito, sp. nov. [Figs. 7–8]

Differt ab *Cirsio suffulto*, phyllariis involucrel (8–)9–10-seriatis, flosculis hermaphroditis;

ab *C. pseudosuffulto*, foliis caulinarum ovatis vel late ovatis profunde pinnatilobatis, lobiis foliorum acunularis, capitulis magnioribus, phyllariis exterinis et mediis involucrel longioribus, patentibus vel ascendentibus, vittis vestigialibus non nisi super phyllariis involucrel intimis.

TYPE. JAPAN: KYUSHU; Miyazaki Pref., Nishi-Usuki-gun, Gokase-cho, Kuraoka, the Kyushu Mountain Range, Mt. Shiraiwa-yama, the summit area, 32° 33' 57.0" N 130° 06' 35.9" E, alt. 1581 m, 9 October 2008, Y. Kadota 088010 (TNS 776509–holotype; Fig. 8).

A hermaphrodite, perennial, herbaceous plant, 0.7–1.8 m tall. Rootstock firm, vertical, 1–1.5 cm in diameter, with cord-like roots; roots up to 80 cm or longer. Stem suberect, 2–4 times branched from the upper part, leafy, striate, arachnoid and densely covered with short brownish hairs above the middle part. Basal leaves always withering at anthesis. Middle cauline leaves deep green on the adaxial side, usually variegated, subcoriaceous and somewhat fleshy, slightly auriculate and subamplexicaul, but not decurrent, short petiolate or sessile; blades ovate to broadly ovate in outline, 32–40 cm long, 18–27 cm broad, glabrous on the adaxial side and pubescent with long brownish hairs along midribs on the abaxial side, deeply pinnatilobate, 7–10-jugate; lobes narrowly ovate, 5–10 cm long, 1.5–3 cm broad, sharpe-angled, with strong spines 3–5 mm long; petioles, if present, 1–1.5 cm long. Upper cauline leaves medially pinnatilobate, sessile, auriculate and amplexicaul, but not decurrent. Flowers in September to October. Capitula 2–4 in a loose raceme, nodding, with peduncles 3.5–16 cm long, 1–2 mm in diameter at apex; subtending leaves ca. 5, narrowly lanceolate to lanceolate, 0.5–10 cm long, with sharp spines 3–6 mm long. Involucres campanulate to broadly cylindrical, 20–25 mm long, (8–)12–15 mm (*in vivo*) and 2–3 cm (*in sicco*) in diameter, sparingly arachnoid. Phyllaries 8–10-seriate, ascending to gently recurved; glandular bodies vestigial only on the inner ones, linear, eglutinous; outer phyllaries narrowly ovate with long acuminate tips, 20–23 mm long, slightly



Fig. 7. Habit of *Cirsium akimotoi* Kadota et Masami Saito (Mt. Shiraiwa-yama, Gokase-cho, Nishi-Usuki-gun, Miyazaki Pref., alt. 1581 m, on 9 October 2008). Left corner inset shows a capitulum.



Fig. 8. Type specimen of *Cirsium akimotoi* Kadota et Masami Saito (JAPAN: KYUSHU; Miyazaki Pref., Nishi-Usuki-gun, Gokase-cho, Kuraoka, Mt. Shiraiwa-yama, the summit area, 32°33'57.0"N 130°06'35.9"E, alt. 1581 m, 9 October 2008, Y. Kadota 088010, TNS 776509, holotype).

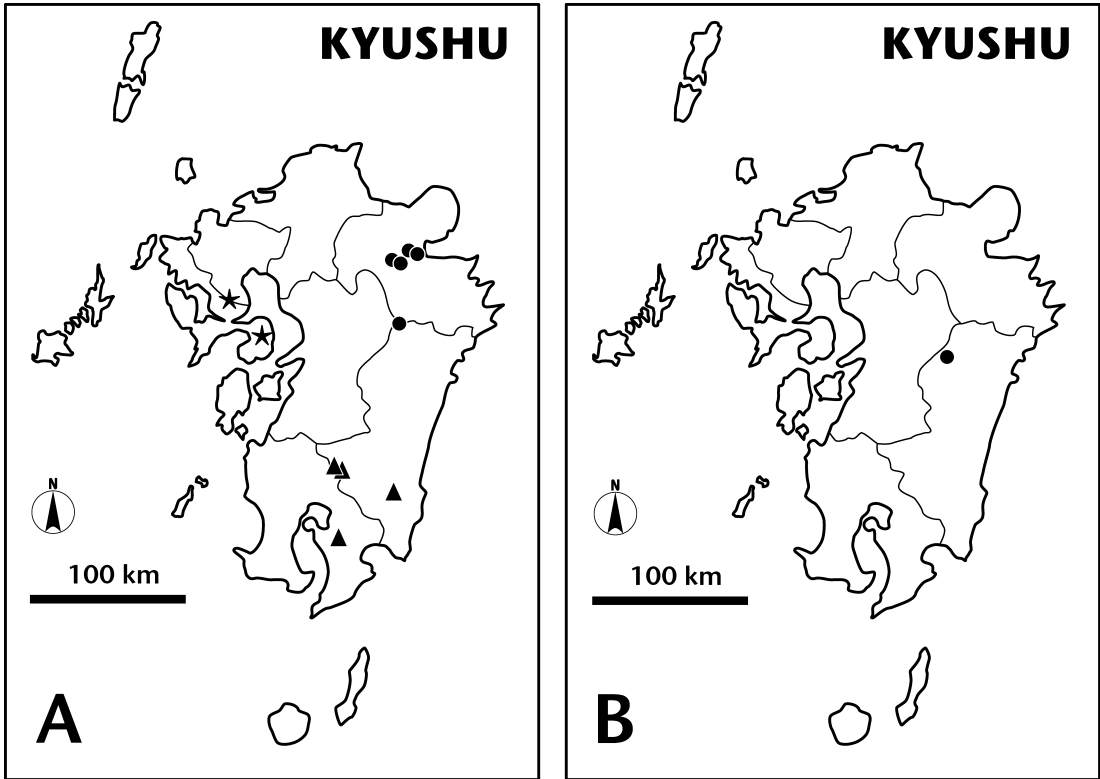


Fig. 9. Distribution of *Cirsium* species in Kyushu. A. Sect. *Onotrophe* subsect. *Tsukushicoka*. Triangle. *C. kirishimense* Kadota et Masami Saito. Disc. *C. kujuense* Kadota. Star. *C. unzenense* Kadota et Masami Saito. B. *C. akimotoi* Kadota et Masami Saito (sect. *Onotrophe* subsect. *Suffulta*).

shorter than the inner ones, herbaceous, terminated with sharp spines ca. 3 mm long. Corollae pale violet, 19–22 mm long; lobes 4–5 mm long; throats 6–7 mm long; tubes 9–11 mm long, longer than the throats. Achenes pale purplish gray, 3.5–4 mm long, ribbed and slightly striate; pappus sordid, (14–)18–22 mm long.

Chromosome number: $2n = 4x = 68$.

Japanese name: Shiraiwa-azami (nom. nov.).

Distribution: Kyushu (Mt. Shiraiwa-yama, the Kyushu Mountain Range, Miyazaki Pref.; Fig. 9, B). Endemic to Japan.

Additional specimens examined: JAPAN: KYUSHU; **Miyazaki Pref.**, Nishi-Usuki-gun, Gokase-cho, Mt. Shiraiwa-yama, 32°33'57.0"N 130°06'35.9"E, alt. 1851 m, 9 Oct. 2008, Y. Kadota 088001–088009, 088011–088012 (TNS 776491–776508, 776510–776514).

The specific epithet is dedicated to Mr. Osamu Akimoto who has devoted himself to the protection of plant and wildlife in Mt. Shiraiwa-yama, Miyazaki Prefecture, Kyushu.

Cirsium akimotoi is distinguished from *C. suffultum* by (8–)9–10-seriate involucre phyllaries and hermaphrodite florets; from *C. pseudosuffultum* Kadota by having ovate to broadly ovate, deeply pinnatilobate cauline, leaf lobes ascending at an acute angle, larger capitula, longer, spreading (patent) to ascending involucre phyllaries, shorter achenes and linear, vestigial glandular bodies only on the involucre phyllaries.

Cirsium akimotoi grows under scattered *Fagus crenata* woods and in herbages among limestones exclusively in the summit area of Mt. Shiraiwa-yama.

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References

- Hara, H. 1952. Genus *Cirsium*. Enumeratio Spermatophytarum Japonicarum. Pars Secunda. pp. 167–187. Iwanami Shoten, Tokyo.
- Kadota, Y. 1989. Genus *Cirsium*. In: Ono, M., Ohba, H. and Nishida, M. (eds.), Makino's New Illustrated Flora of Japan. pp. 799–807. Hokuryukan, Tokyo (in Japanese).
- Kadota, Y. 1990. Taxonomy and distribution of *Cirsium brevicaulis* A. Gray and its related species (Asteraceae). *Memoir of the National Science Museum* (23): 51–61.
- Kadota, Y. 1991. Taxonomic studies of *Cirsium* (Asteraceae) of Japan I. Alpine species of central Honshu—the *Cirsium fauriei* group. *Bulletin of the National Science Museum, Series B* 17: 123–139.
- Kadota, Y. 1993. Lectotypification of six species and a new species of Japanese *Cirsium* (Asteraceae). *Bulletin of the National Science Museum, Series B* 19: 45–57.
- Kadota, Y. 1995a. Genus *Cirsium* (Asteraceae). In: Iwatsuki, K., Yamazaki, T., Boufford, D. E. and Ohba, H. (eds.), *Flora of Japan new English ed.*, 2nd ed. **IIIb**: 119–151. Maruzen, Tokyo.
- Kadota, Y. 1995b. Taxonomic studies of *Cirsium* (Asteraceae) of Japan II. Three new species and a new variety of *Cirsium nipponicum* (Maxim.) Makino from central Honshu. *Bulletin of the National Science Museum, Series B* 20: 13–27.
- Kadota, Y. 1996. *Cirsium abukumense*—a new species of *Cirsium* (Asteraceae) from the Abukuma Mountains, northeastern Japan. *Memoir of the National Science Museum* (29): 93–98.
- Kadota, Y. 1997a. Taxonomic studies of *Cirsium* (Asteraceae) of Japan III. *Cirsium occidentalinipponense*, sp. nov. with special reference to the lectotypification of *Cirsium borealinipponense* Kitam. *Bulletin of the National Science Museum, Series B* 23: 115–125.
- Kadota, Y. 1997b. Genus *Cirsium*. In: Shimizu, T. (ed.), *Flora of Nagano Prefecture*, pp. 1127–1140. Shinano Mainichi Shinbunsha, Nagano (in Japanese).
- Kadota, Y. 1998a. Taxonomic studies of *Cirsium* (Asteraceae) of Japan IV. Notes on *Cirsium lucens* Kitam. from southwestern Japan. *Memoir of the National Science Museum* (30): 65–71.
- Kadota, Y. 1998b. Taxonomic studies of *Cirsium* (Asteraceae) of Japan V. *Cirsium umezawanum*, a new species from Island Rishiri, Hokkaido and a new white-flowered form of *Cirsium amplexifolium* Kitam. *Bulletin of the National Science Museum, Series B* 24: 147–156.
- Kadota, Y. 1999. Taxonomic studies of *Cirsium* (Asteraceae) of Japan VI. Two new species, *Cirsium hidakamontanum* and *Cirsium zawoense* from northern Japan. *Bulletin of the National Science Museum, Series B* 25: 95–105.
- Kadota, Y. 2000. Taxonomic studies of *Cirsium* (Asteraceae) in Japan VII. Notes on *Cirsium congestissimum* Kitam. and *Cirsium tenue* Kitam. and the identity of *Cirsium tenue* Kitam. var. *ishizuchiense* Kitam. *Memoir of the National Science Museum* (32): 127–134.
- Kadota, Y. 2002a. Taxonomic studies of *Cirsium* (Asteraceae) in Japan VIII. *Cirsium shidokimontanum*, a new Species from middle Honshu. *Bulletin of the National Science Museum, Series B* 28: 99–106.
- Kadota, Y. 2002b. Taxonomic studies of *Cirsium* (Asteraceae) in Japan IX. On the entity of *Cirsium yatsugatakense* Nakai. *Memoir of the National Science Museum* (38): 110–118.
- Kadota, Y. 2003. Taxonomic studies of *Cirsium* (Asteraceae) in Japan X. Species described by Franchet and Savatier. *Bulletin of the National Science Museum, Series B* 29: 45–64.
- Kadota, Y. 2004a. Taxonomic studies of *Cirsium* (Asteraceae) in Japan XI. A new subsection and two new species belonging to the subsection, from Southern Kyushu. *Bulletin of the National Science Museum, Series B* 30: 63–69.
- Kadota, Y. 2004b. Taxonomic Studies of *Cirsium* (Asteraceae) in Japan XII. Subsect. *Nipponensia* Subsect. Nov. and a New Species, *C. hachimantaiense*, Belonging to the New Subsection. *Bulletin of the National Science Museum, Series B* 30: 117–133.
- Kadota, Y. 2004c. Classification of the genus *Cirsium* (Asteraceae) in Japan. *Bulletin of the Fukui Botanical*

- Garden* (2): 1–6 (in Japanese).
- Kadota, Y. 2005. Taxonomic Studies of *Cirsium* (Asteraceae) in Japan XIII. Three new species from Tohoku District, northern Japan. *Bulletin of the National Science Museum, Series B* **31**: 35–47.
- Kadota, Y. 2006a. Taxonomic studies of *Cirsium* (Asteraceae) in Japan XIV. Notes on *Cirsium hachijoense* Nakai. *Memoir of the National Science Museum* (42): 89–98.
- Kadota, Y. 2006b. Taxonomic Studies of *Cirsium* (Asteraceae) in Japan XV. Four new species from western Japan. *Bulletin of the National Science Museum, Series B* **32**: 85–101.
- Kadota, Y. 2007. Taxonomic Studies of *Cirsium* (Asteraceae) in Japan XVI. A new subsection and four new species from the Tohoku district, northern Japan. *Bulletin of the National Museum of Nature and Science, Series B* **33**: 29–45.
- Kadota, Y. 2008. Taxonomic Studies of *Cirsium* (Asteraceae) in Japan XVII. Two species from the Hokkaido and Honshu. *Bulletin of the National Museum of Nature and Science, Series B* **34**: 31–41.
- Kadota, Y. and Nagase, H. 1988. A new species of *Cirsium* (Asteraceae: Cynareae) from Hida Province, central Japan. *Memoir of the National Science Museum* (14): 9–20.
- Kitamura, S. 1934. Les Cirses de l'Asie Orientale; leur classification et leur distribution. *Acta Phytotaxonomica et Geobotanica* **3**: 1–14 (in Japanese).
- Kitamura, S. 1937. *Cirsium*. Compositae Japonicae 1. *Memoirs of the College of Science, Kyoto Imperial University, Series B*, **13**: 33–134.
- Kitamura, S. 1957. *Cirsium*. In: Kitamura, S., Murata, G. and Hori, M., Coloured Illustrations of Herbaceous Plants of Japan (Sympetalae) **I**: 30–40. Hoikusha, Osaka (in Japanese).
- Kitamura, S. 1981. *Cirsium*. In: Satake, Y., Ohwi, J., Kitamura, S., Watari, S. and Tominari, T., Wild Flowers of Japan Herbaceous Plants (Including Dwarf Subshrubs) **III**: 212–220. Heibonsha Ltd., Tokyo (in Japanese).
- Masamune, G. 1974. Genus *Cirsium*. Color Illustrated Flora of Japan. **6-II**: 309–330. Koyo Shoin, Tokyo (in Japanese).
- Nakai, T. 1912. De *Cirsio Japonico* et *Coreano*. *Botanical Magazine (Tokyo)* **26**: 351–383.
- Ohwi, J. 1953. Genus *Cirsium*. Flora of Japan. pp. 1204–1221. Shibundo, Tokyo (in Japanese).
- Ohwi, J. 1965. Genus *Cirsium*. Flora of Japan, revised edition. pp. 1368–1386. Shibundo, Tokyo (in Japanese).
- Ohwi, J. (Kitagawa, M.) 1983. Genus *Cirsium*. New Flora of Japan, revised. pp. 1518–1536. Shibundo, Tokyo (in Japanese).
- Ohwi, J. 1984. Genus *Cirsium*. In: Meyer, F. G. and Walker, E. H. (eds.), Flora of Japan (in English). pp. 902–912. Smithsonian Institution, Washington, D. C.
- Sugimoto, J. 1978. Genus *Cirsium*. Keys to Herbaceous Plants of Japan. I. Dicotyledoneae. Revised and enlarged. pp. 651–667. Inoue Book Company, Tokyo (in Japanese).
- Watanabe, S. and Imae, S. 1976. A new variety of *Cirsium lucens*. *Journal of Japanese Botany* **51**: 158–160.