

Taxonomic Studies of *Cirsium* (Asteraceae) in Japan XVI. A New Subsection and Four New Species from the Tohoku District, Northern Japan

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Abstract A new subsection and four new species of the genus *Cirsium* from the Tohoku District, northern Japan are reported here. *Cirsium togaense* Kadota is described from the Oga Peninsula, Akita Pref. and characterized by erect capitula, campanulate involucre, 12–13-seriate, strongly recurved involucre phyllaries and oblong glandular bodies on middle and inner phyllaries. *Cirsium domonii* Kadota is described from the maritime mountains of Akita and Yamagata Prefs. and is characterized by having also erect capitula, subentire and coarsely serrate cauline leaves and strongly recurved phyllaries with vestigial glandular bodies. Both *C. togaense* and *C. domonii* have close relationship to *C. umezawanum* Kadota described from Rishiri Island, northern Hokkaido. Hence, a new subsection of sect. *Onotrophe* (Cass.) DC., subsection *Littoralicola* Kadota, is proposed for the three species above stated. *Cirsium katoanum* Kadota is described from Yamagata Pref. and is characterized by having somewhat fleshy cauline leaves, erect to oblique capitula, narrowly cylindrical to cylindrical involucre, 11–12-seriate, recurved, undulate involucre phyllaries, oblanceolate glandular bodies and gynodioecy. *Cirsium takahashii* is also described from Yamagata Pref. and is characterized by erect to oblique capitula, cylindrical involucre, the presence of oblanceolate glandular bodies and gynodioecy. Both *C. katoanum* and *C. takahashianum* belong to sect. *Onotrophe* subsection *Tubelosae*.

Key words : Honshu, new species, new subsection, the Tohoku District.

Introduction

A part of the revisional work on the Japanese *Cirsium* (Asteraceae) I have reported some results based on both field and herbarium examinations (Kadota, 1989–2006; Kadota and Nagase, 1988). Here I will report a new subsection and four new species from the Tohoku District, northern Japan.

A thistle characterized by the absence of basal leaves at anthesis, campanulate involucre and erect capitula grows in maritime herbal stands of the Oga Peninsula, Akita Prefecture. This thistle is described here as a distinct species, *Cirsium togaense*. In maritime mountains of Akita and Yamagata Prefectures a thistle similarly characterized by the absence of basal leaves at anthesis,

campanulate involucre and erect capitula occurs. However, this maritime thistle is different from *C. togaense* in having less involucre phyllaries (10–11-seriate vs. 12–13-seriate), subentire and coarsely serrate cauline leaves vestigial glandular bodies only on the innermost involucre phyllaries. This thistle is hence described as *C. domonii*. Both *C. togaense* and *C. domonii* have the chromosome number $2n=4x=68$. *Cirsium umezawanum* Kadota (1998b) described from Rishiri Island, northern Hokkaido, is closely related to the two species. Then a new subsection of sect. *Onotrophe* (Cass.) DC., subsection *Littoralicola*, is described based on *C. umezawanum* as the type species.

A thistle belonging to the subsection *Tubelosae* Kitam. of sect. *Onotrophe* occurs in 'Jagaramog-

ara', Tendô-shi, Yamagata Prefecture. Among the species of subsect. *Tubelosae* this thistle is characterized by having somewhat fleshy and subentire and coarsely serrate cauline leaves, more involucrel phyllaries and well developed glandular bodies and is described as a new species, *C. katoanum*. *Cirsium katoanum* is restricted to Jagaramogara, Tendô-shi, Yamagata Prefecture. At Shakadô, Yamagata-shi, Yamagata Prefecture a thistle similar to *C. katoanum* grows. The thistle from Shakadô is distinguished from *C. katoanum* in having long, recurved involucrel phyllaries and the absence of glandular bodies and is also described as a new species, *C. takahashii*. *Cirsium takahashii* is exclusively reported from Yamagata Prefecture.

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. *Littoralicola* Kadota, subsect. nov.

Herba perennis, hermaphrodita, foliis basalibus emarcidis sub anthesin, eis caulinis infernis coreaceis, capitulis erectis, involucreis campanulatis vel late cylindricis, numero chromosomatibus $2n=4x=68$.

Type: *Cirsium umezawanum* Kadota.

Hermaphrodite, perennial herbs. Basal leaves withering at anthesis. Lower cauline leaves coriaceous. Capitula erect. Involucres campanulate to broadly cylindrical. Chromosome number $2n=4x=68$.

1. *Cirsium togaense* Kadota, sp. nov.

[Figs. 1–2]

Haec species affine *Cirsio umezawano*, sed phyllariis involucreorum 12–13-seriatis, foliis caulinis breviter petiolatis et basi non amplexicaulibus, vittis oblongis, phyllariis extrioribus 3

mm longis brevioribus differt.

TYPE: JAPAN: HONSHU; Akita Pref., Oga-shi, the Oga Peninsula, Toga, Kamo Aosa, in maritime herbal stand facing to the Japan Sea, 39°54'40"N 139°43'50"E, alt. 50 m, 15 Sept. 2005, Y. Kadota 055206 (TNS 753098–753099–holotype).

A hermaphrodite, perennial, herbaceous plant, 1–2 m tall. Rootstock stout, horizontal, up to 3 cm in diameter, with cord-like roots. Stem robust, sulcate, erect, much branched from the middle part, sparingly arachnoid. Basal leaves withering at anthesis. Lower cauline leaves dull green above, coriaceous, ovate to narrowly ovate in outline, coarsely serrate to deeply pinnatilobate, 22–40 cm long, 18–20 cm wide, provided with spines 1–3 mm long, sparingly arachnoid on both sides, shortly petiolate, not decurrent; if pinnatilobate, lobes 2–6-jugate, narrowly ovate, 2–10 cm long, 1–2 cm wide; petioles 3–6 cm long, sparingly arachnoid. Upper cauline narrowly ovate, shortly petiolate to sessile. Flowers in September to October. Capitula 3–6 in a compact raceme, erect or oblique; peduncels 0.5–1.5 cm long, densely arachnoid; subtending leaves 3–5, narrowly lanceolate to narrowly ovate-lanceolate, 3–5 mm long, provided with weak spines ca. 1 mm long. Involucres campanulate to broadly cylindrical, slightly glutinous, 18–20 mm long, 8–12 mm (*in vivo*) and ca. 2 cm (*in sicco*) in diameter, scarcely arachnoid. Phyllaries 12–13-seriate, coriaceous, terminated with weak spines ca. 1 mm long; glandular bodies oblong on middle and inner ones; inner phyllaries linear-lanceolate, ca. 15 mm long, erect; outer ones narrowly ovate with caudate tips ca. 3 mm long, strongly recurved. Corollae pale violet, 15–17 mm long; lobes 3–4 mm long; throats 6–7 mm long; tubes 5–7 mm long, as long as or clearly shorter than the throats. Achenes light brownish gray, ca. 4 mm long, 4-angled, finely striate; pappi sordid, 12–15 mm long.

Chromosome number: $2n=4x=68$ (present paper).

Japanese name: Toga-azami (nov.).

Distribution and habitat: Tohoku (maritime

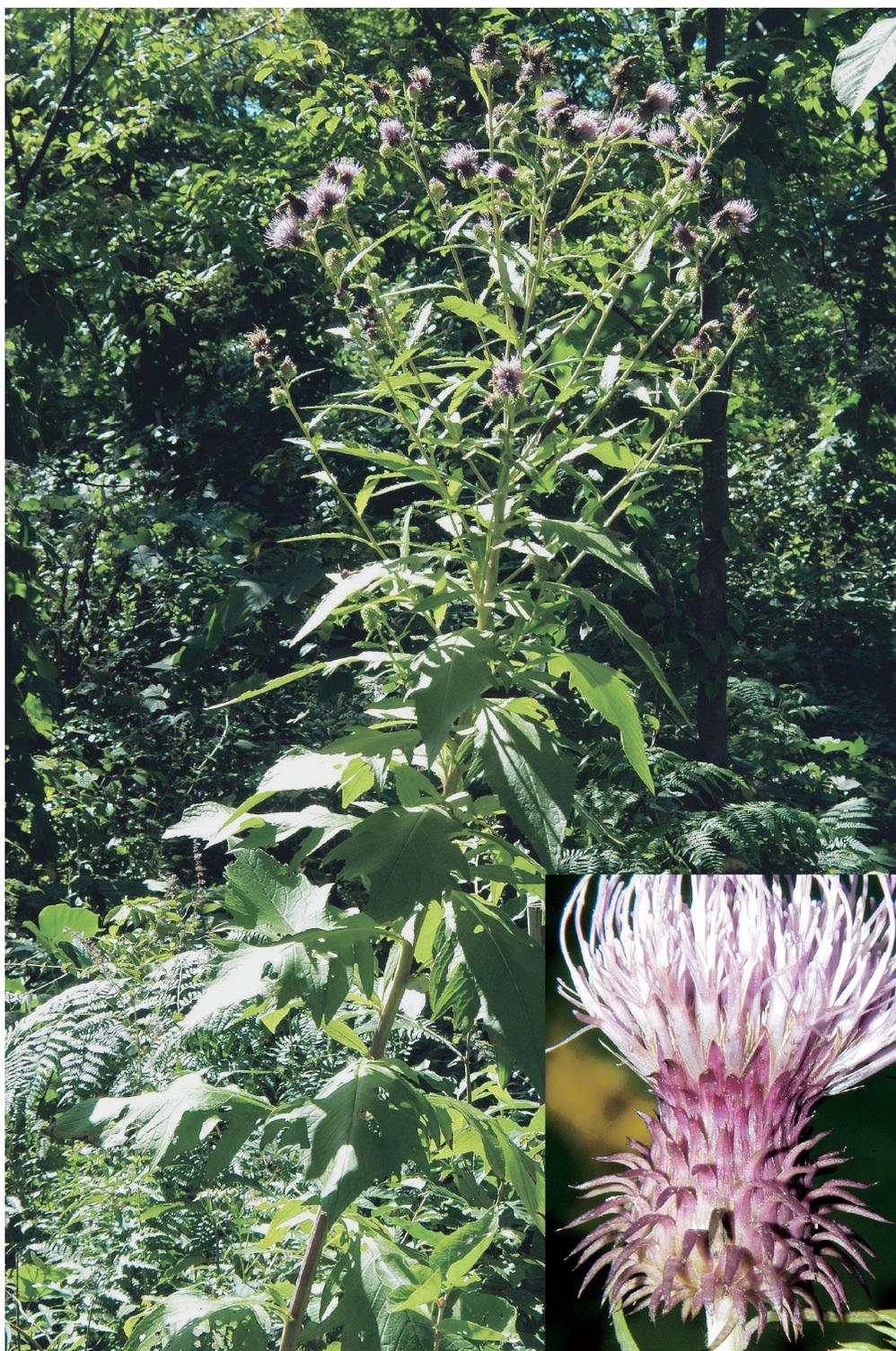


Fig. 1. Habit of *Cirsium togaense* Kadota (Kitaura, Oga Peninsula, Oga-shi, Akita Pref., Honshu, 15 Sept. 2005). Right corner inset shows a capitulum.



Fig. 2. Holotype specimen of *Cirsium togaense* Kadota (Kamo Aosa, Oga Peninsula, Oga-shi, Akita Pref., Honshu, 15 Sept. 2005, Y. Kadota 034806, TNS 753098).

mountains facing to the Japan Sea, the Oga Peninsula, Akita Pref.; Fig. 11, star). Endemic to Japan. Growing in tall herbal stands or along the margin of summer-green woodlands: alt. 50–220 m.

Specimens examined: JAPAN: HONSHU; **Akita** Pref., Oga-shi, Hiraku, alt. 220 m, 3 Nov. 2000, Y. Horii 2016–2018 (TNS 704802–704804); Oga-shi, the Oga Peninsula, Toga, Kitaura, Nishi-Mizuguchi, in herbal stand among summer-green woodland, 39°57′15″N 139°45′39″E, alt. 125 m, 15 Sept. 2005, Y. Kadota 055302–055303 (TNS 753126–753129); the Oga Peninsula, Toga, Kamo Aosa, in herbal stand facing to the Japan Sea, 39°54′40″N 139°43′50″E, alt. 50 m, 15 Sept. 2005, Y. Kadota 055201–055206 (TNS 753092–753099); the Oga Peninsula, Ashinokura-sawa gorge, alt. 170 m, 20 Sept. 2005, Y. Horii 2610–2611 (TNS 759658, 759660).

Cirsium togaense is discriminated from *C. umezawanum* by having 12–13-seriate involucrellary phyllaries, lanceolate, shorter outer phyllaries 3 mm long, petiolate, non amplexicaul cauline leaves and the presence of oblong glandular bodies on the middle and inner phyllaries.

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

[Figs. 3–4]

Differt ab *Cirsio umezawano*, phyllariis involucrellary 10–11-seriatis, foliis caulinis anguste ellipticis et subintegris; ab *C. togaense*, phyllariis involucrellary 10–11-seriatis, foliis caulinis anguste ellipticis, subintegris et basi amplexicaulis, absentia vittae.

TYPE: JAPAN: HONSHU; Yamagata Pref., Tsuruoka-shi, Kamo, Kasuga Jinja Shrine, alt. 30 m, Y. Kadota 044149 (TNS 744366–744368–holotype).

A hermaphrodite, perennial, herbaceous plant, 0.7–2 m tall. Rootstock stout, horizontal, up to 2 cm in diameter, with cord-like roots. Stem robust, sulcate, erect, much branched from the middle part, sparingly arachnoid. Basal leaves withering at anthesis. Lower cauline leaves deep green above, coriaceous or rarely herbaceous (in

evergreen woodland), elliptic in outline, subentire, 15–25 cm long, 5–10 cm wide, provided with weak spines 0.5–2 mm long, glabrous on both sides, shortly petiolate, slightly to widely auriculate, not deccurrent; petioles 1–8 cm long, glabrous. Upper cauline leaves narrowly elliptic, shortly petiolate, slightly auriculate. Flowers in September to October. Capitula 2–3 in a loose raceme, erect to oblique; peduncels 0.5–2.5 cm long, thin, densely arachnoid; subtending leaves 3–5, linear, 1–3 cm long, provided with sharp spines ca. 1 mm long. Involucres broadly cylindrical, eglutinous, 17–20 mm long, 8–12 mm (*in vivo*) and 2–3 cm (*in sicco*) in diameter, scarcely arachnoid. Phyllaries 10–11-seriate, coriaceous, terminated with weak spines ca. 1 mm long; glandular bodies absent; inner phyllaries linear-lanceolate, ca. 18 mm long, erect; outer ones narrowly ovate, ca. 5 mm long, strongly recurved. Corollae pale violet, 19–20 mm long; lobes 5 mm long; throats 5–6 mm long; tubes 9–10 mm long, two times longer than the throats. Achenes ivory to light brownish gray, 3.5–4 mm long, not angled, finely striate; pappi sordid, 10–15 mm long.

Chromosome number: $2n=4x=68$ (present paper).

Japanese name: Ryô-u-azami (nov.).

Distribution and habitat: Tohoku (maritime mountains facing to the Japan Sea, west foot of Mt. Chôkai-san and the Kamo Hills, Akita and Yamagata Prefs; Fig. 11, disc). Endemic to Japan. Growing along the margin of evergreen woodland and in herbal stands among summer-green woodlands: alt. 20–200 m.

Specimens examined: JAPAN: HONSHU; **Akita** Pref., Nikaho-shi, Ryôzenji, 39°18′N 139°58′E [the northernmost limit of *C. domonii*], alt. 23 m, 22 Sept. 2006, Y. Kadota 066471 (TNS 759647); Nikaho-shi, Kosagawa, 39°07′N 139°53′E, alt. 50 m, 22 Sept. 2006, Y. Kadota 066461 (TNS 759652); Nikaho-shi, Konoura, Konourasan Jinja Shrine, 39°15′47″N 139°54′57″E, alt. 20 m, 22 Sept. 2006, Y. Kadota 066451–066453 (TNS 759649–759651); Nikaho-shi, Misakiyama, 39°07′N 139°52′, alt. 20 m, 22 Sept. 2006, Y. Kadota 066436–066437 (TNS



Fig. 3. Habit of *Cirsium domonii* Kadota (Kobato, Tsuruoka-shi, Yamagata Pref., Honshu, 20 Sept. 2006). Left corner inset shows a capitulum.

759653–759654). **Yamagata** Pref., Akumi-gun, Yuza-machi, Jūroku Rakan, 39°04'24"N 139°52'04"E, alt. 20 m, 22 Sept. 2006, Y. Kadota 066401 (TNS 759656); Yuza-machi, Takino-ura-Mega, 39°06'N 139°52'E, alt. 40 m, 22 Sept. 2006, Y. Kadota 066417 (TNS 759657); Yuza-machi, Misaki, Misaki Shrine, 39°06'N 139°52'E, alt. 20 m, 22 Sept. 2006, Y. Kadota 066427 (TNS 759655); Tsuruoka-shi, Kamo, Kasuga Jinja Shrine, along sea shore, alt. 30 m, 29 Sept. 2004, Y. Kadota 044147–044150 (TNS 744368–744371); Tsuruoka-shi, Imaizumi, Ishikiri Tsuruoka Shrine, along sea shore, alt. 20 m, 29 Sept. 2004, Y. Kadota 044150–044151 (TNS 744391–744392); Tsuruoka-shi, Aburato, 38–44'N 139–42'E, alt. 20 m, 20 Sept. 2006, Y. Kadota 066201–066203 (TNS 759635–759637); Tsuruoka-shi, Kobato, Kōtai Shrine, 38°41'28"N 139°38'58", alt. 50 m, 16 Sept. 2005, Y. Kadota 055401–055411 (TNS 753031–753033, 753062–753068, 753112–753115); Kobato, 38°42'09"N 139°39'17"E [the southernmost limit of *C. domonii*], alt. 50 m, 20 Sept. 2006, Y. Kadota 066204 (TNS 759638).

The specific epithet '*domonii*' is dedicated to Mr. Shōzō Domon, Yuza-machi of Yamagata Pref., who contributed to floristic studies of Yamagata Prefecture, northern Japan. The Japanese name is derived from the distribution range which covers 'Ugo' and 'Uzen' (the old regional names of Akita and Yamagata Prefectures, respectively).

Cirsium domonii is distinguished from *C. umezawanum* by having 10–11 seriate involucrellal phyllaries and elliptic, subentire cauline leaves and from *C. togaense* by having also having 10–11 seriate involucrellal phyllaries, elliptic, subentire cauline leaves amplexicaul at base and the absence of glandular bodies.

Subsect. **Tuberosae** Kitam. in Acta Phytotax. Geobot. 3: 5 (1934) – Kadota, Fl. Jap. **IIIb**: 143 (1995).

3. *Cirsium katoanum* Kadota, sp. nov.

[Figs. 5–7]

Differt ab *Cirsio heiiano*, phyllariis involucrellal 11–12-seriatis et undulatis, vittis lanceolatis in phyllariis involucrellal mediis et extribus, foliis caulibus aliquantum carnosus, habitu gynodioecio; ab *C. albrechto*, foliis caulibus aliquantum carnosus, petiolatis, non amplexicaulis, phyllariis involucrellal undulatis, habitu gynodioecio.

TYPE: JAPAN: HONSHU; Yamagata Pref., Tendō-shi, Nukudu, Jagaramogara, 38°20'38"N 140°26'17"E, alt. 640 m, 21 Sept. 2006, Y. Kadota 066302 (TNS 758645–holotype; hermaphrodite plant). Yamagata Pref., Tendō-shi, Nukudu, Jagaramogara, 9 Sept. 1998, S. Katō 9801 (TNS 671274–paratype; female plant).

A gynodioecious, perennial, herbaceous plant, 1–2 m high. Root stock stout, horizontal, up to 2 cm in diameter, with cord-like roots. Stem sulcate, erect to suberect, much branched from the middle part, arachnoid in the upper part. Basal leaves withering at anthesis. Middle cauline leaves grayish green on the adaxial side, glaucous on the abaxial side, fleshy, narrowly ovate-elliptic to narrowly elliptic in outline, subentire and coarsely serrate, 17–29 cm long, 6–9 cm wide, provided with weak spines 0.5–1 mm long, glabrous on both sides, petiolate to sessile, not auriculate, not decurrent. Flowers in September to October. Capitula erect to oblique, several to numerous in a raceme or panicle or sometimes aggregated; peduncles (0–)0.5–3 cm long, sparingly arachnoid; subtending leaves 1–2, narrowly lanceolate, 3–5 cm long, provided with weak spines ca. 1 mm long. Involucres narrowly cylindrical to cylindrical, slightly glutinous, in hermaphrodite plants, 12–18 mm long, 8–12 mm (*in vivo*) and 9–20 mm (*in sicco*) in diameter, in female plants, 10–12(–16) mm long, 6–9 mm (*in vivo*) and 10–15(–18) mm (*in sicco*) in diameter, arachnoid. Phyllaries 11–12-seriate, herbaceous, undulate, terminated with weak spines ca. 0.5 mm long; glandular bodies oblanceolate, on inner phyllaries; innermost phyllaries broadly linear, ca. 10 mm long; outer phyllaries ovate with



Fig. 4. Holotype specimen of *Cirsiium domonii* Kadota (Kamo, Tsuruoka-shi, Yamagata Pref., Honshu, 29 Sept. 2004, Y. Kadota 044149, TNS 744368).



Fig. 5. Habit of *Cirsium katoanum* Kadota (Jagaramogara, Tendô-shi, Yamagata Pref., Honshu, 21 Sept. 2006).

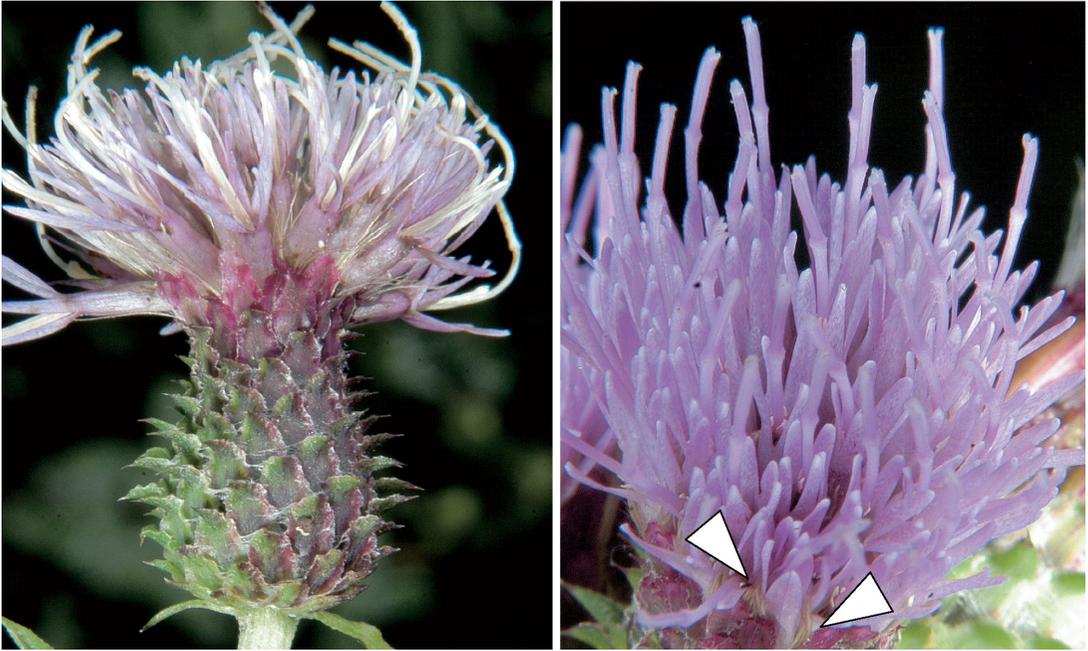


Fig. 6. Capitula of *Cirsium katoanum* Kadota (Jagaramogara, Tendô-shi, Yamagata Pref., Honshu, 21 Sept. 2006). Left. Hermaphrodite plant. Right. Female plant. Arrowheads show degenerated anthers.

strongly or gently recurved with caudate tips, 3 mm long. Corollae, in hermaphrodite plants, pale violet (Fig. 6, left), 14–18 mm long; lobes 4–4.5 mm long; throats 4–5.5 mm long; tubes 6–8 mm long, longer than the throats, in female plants, pink (Fig. 6, right), 10–14 mm long; lobes 1.5–4 mm long; throats 3.5–5 mm long; tubes 5–5.5 mm long, slightly longer than the throats. Achenes ivory-white or sometimes pale purplish brown, 3.5–4 mm long, ribbed, clearly striate; pappi sordid, 8–12 mm long.

Chromosome number: $2n=2x=68$ (present paper).

Japanese name: Uzen-hime-azami (nov.).

Distribution and habitat: Tohoku (the Ô-u Mountain Range, Yamagata Pref.; Fig. 11, square). Growing in tall herb stands on rocky slopes: ca. 500 m. Endemic to Japan.

Specimens examined: JAPAN: HONSHU; **Yamagata** Pref., Tendô-shi, Nukudu, Jagaramogara, 18 Aug. 1997, S. Kato 9701* (TNS 650188*); Jagaramogara, 22 Oct. 1997, S. Kato B1*, B2* (TNS 650179*–650180*); Jagaramo-

gara, 9 Sept. 1998, S. Kato f, 9801*, 9804* (TNS 671376*, 671385*–671386*, 671387); Jagaramogara, alt. 630 m, 25 Sept. 1998, Y. Kadota 985110*, 985113*–985114*, 985115–985116, 985117*–985119*, 985120–985121 (TNS 674293*, 674296*–674297, 674298–674299, 674330*, 674332, 674334, 674335*–674336*); Jagaramogara, alt. 630 m, 13 Oct. 2000, S. Kato 1*, 2 (TNS 758368*, 758369–758370); Jagaramogara, 10 Sept. 2006, N. Takahashi s. n. (TNS 758685); Jagaramogara, 18 Sept. 2006, N. Takahashi 2*, 5–6 (TNS 758687*, 758690–758691); Jagaramogara, 38°20′38″N 140°26′17″E, alt. 640 m, 21 Sept. 2006, Y. Kadota 066301, 066303, 066305, 066306*, 066307 (TNS 758625, 758626*, 758627, 758640, 758643–758644, 758646). The collection number attached by “*” shows a female plant.

The specific epithet ‘*katoanum*’ is dedicated to Mr. Shin-ei Kato, Tsuruoka-shi of Yamagata Pref., who was aware of the presence of this thistle.

Cirsium katoanum is distinguished from *C.*



Fig. 7. Holotype specimen of *Cirsium katoanum* Kadota (Jagaramogara, Nukuzu, Tendô-shi, Yamagata Pref., Honshu, 21 Sept. 2006, Y. Kadota 066302, TNS 758645).

heitanum by having 11–12-seriate, undulate involucrel phyllaries, the presence of glandular bodies on middle and inner involucrel phyllaries, somewhat fleshy cauline leaves and gynodioecious habit and from *C. albrechtii* by having somewhat fleshy, petiolate, non amplexicaul cauline leaves, undulate involucrel phyllaries and gynodioecious habit.

The gynodioecy of *C. katoanum* was conspicuous and anthers of female plants were completely degenerated (Fig. 6, right). There observed some differences between the female and hermaphrodite plants; florets of the female plants more deeper in color and involucrel and florets were smaller than the hermaphrodite plants.

Cirsium katoanum is restricted to a sole population at Jagaramogara of Yamagata Prefecture. The number of individuals was estimated to be less than one hundred and hence this thistle is regarded as one of endangered species.

4. *Cirsium takahashii* Kadota, sp. nov.

[Figs. 8–10]

Differt ab *Cirsio heiiano* phyllariis involucrium 11–12-seriatis, phyllariis involucrium extribus lanceolatis, vittis oblanceolatis in phyllariis intimis; ab *C. albrechto*, vittis oblanceolatis in phyllariis tantum intimis, foliis petiolatis non amplexicaulis et glabris.

TYPE: JAPAN: HONSHU; Yamagata Pref., Yamagata-shi, Shakadô, the Nakanosawa forest road, along *Cryptomeria japonica* plantation, 38°15'N 140°23'E, alt. 350 m, 17 Sept. 2006, Y. Kadota 066002 (TNS 758629–holotype; hermaphrodite). Yamagata Pref., Yamagata-shi, Shakadô, the Nakanosawa forest road, along *Cryptomeria japonica* plantation, 38°15'N 140°23'E, alt. 350 m, 17 Sept. 2006, Y. Kadota 066004 (TNS 758631–paratype; female).

A gynodioecious, perennial, herbaceous plant, 0.7–2.2 m high. Root stock stout, horizontal, up to 2 cm in diameter, with cord-like roots. Stem sulcate, erect to suberect, much branched from the middle part, arachnoid or glabrous. Basal leaves withering at anthesis. Middle cauline leaves grayish green on the adaxial side, glaucous on

the abaxial side, coriaceous, narrowly obovate-elliptic to narrowly elliptic in outline, subentire and coarsely serrate or sometimes deeply to medially pinnatifid, 20–30 cm long, 5–9 cm wide, provided with weak spines 1–2 mm long, glabrous on both sides, petiolate to sessile, not auriculate or auriculate, not decurrent; if pinnatifid, lobes 3–6-jugate, narrowly ovate, 1–7 cm long, 0.5–2 cm wide. Flowers in September. Capitula erect to oblique, several to numerous in a raceme or panicle or sometimes aggregated, or rarely solitary; peduncles (0–)0.5–4 cm long, arachnoid; subtending leaves 1–2 or sometimes absent, linear to narrowly lanceolate, 3–5 cm long, provided with weak spines ca. 2 mm long. Involucrel narrowly cylindrical or narrowly campanulate (Fig. 8, right), not glutinous, 14–16 mm long, 5–8 mm (*in vivo*) and 15–20 mm (*in sicco*) in diameter, arachnoid. Phyllaries 11–12-seriate, herbaceous, terminated with weak spines ca. 0.5 mm long; glandular bodies oblanceolate, only on the innermost phyllaries; innermost phyllaries broadly linear, ca. 15 mm long; outer phyllaries narrowly ovate with strongly recurved caudate tips, 3 mm long. Corollae pale violet to pink (Fig. 8, right, female plant), 12–19 mm long; lobes (1–)2–4 mm long; throats 5–6 mm long; tubes 4–9 mm long, shorter or longer than the throats. Achenes ivory-white to pale purplish brown, with faintly purplish-lined, 3.5–4.5 mm long, slightly ribbed, not striate; pappi sordid, 10?12 mm long.

Chromosome number: $2n=2x=34$ (present paper).

Japanese name: Mamigasaki-azami (nov.).

Distribution and habitat: Tohoku (the Ô-u Mountains, Yamagata Pref.; Fig. 11, triangle). Growing along summer-green woodlands.

Specimens examined: JAPAN: HONSHU; **Yamagata** Pref., Tendô-shi, Mt. Amayobariyama, 16 Sept. 1936, Y. Yûki s. n. (TNS 64403); Mt. Amayobariyama, alt. 460 m, 25 Sept. 1998, Y. Kadota 985126–985131 (TNS 671481–671485, 671561); Jôge-Jigoku, female, 13 Oct. 2000, S. Kato 3 (TNS 758371–758373). Yamagata-shi, Shakadô, Nakanosawa forest road, along



Fig. 8. Habit of *Cirsium takahashii* Kadota (Shakadô, Yamagata-shi, Yamagata Pref., Honshu, 17 Sept. 2006).



Fig. 9. Capitula of *Cirsium takahashii* Kadota (Shakadô, Yamagata-shi, Yamagata Pref., Honshu, 17 Sept. 2006). Left. Hermaphrodite plant. Right. Female plant.

Cryptomeria japonica plantation, 38°15'N 140°23'E, alt. 350 m, 17 Sept. 2006, Y. Kadota 066001, 066003, 066605–06007 (TNS 758628, 758630–758634); Shakadô, Nakanosawa forest road, 19 Sept. 2006, N. Takahashi 1–4 [Takahashi 1=female] (TNS 758635–758638); Shakadô, Nakanosawa forest road, 26 Sept. 2006, N. Takahashi 5 (TNS 758639).

The specific epithet '*takahashii*' is dedicated to Mr. Nobuya Takahashi, Higashine-shi of Yamagata Prefecture, who found this thistle. The Japanese name is derived from the Mamigasaki River running near the type locality.

Cirsium takahashii is discriminated from *C. heiiianum* Koidz. by having 11–12-seriate involucreal phyllaries, lanceolate outer involucreal phyllaries and the presence of oblanceolate glandular bodies on the innermost involucreal phyllaries, and from *C. albrechtii* (Maxim) Kudo ex Tatew. [= *Cnicus buergeri* (Miq.) Maxim. β . *albrechtii* Maxim.] by the presence of oblanceolate glandular bodies only on the innermost involucreal phyl-

laries and petiolate, non-amplexicaul, glabrous cauline leaves.

Kawakubo (1994, 1995) reported that gynodioecy (male sterility) was observed in forty species of Japanese *Cirsium*. He also stated that the difference between hermaphrodite and female plants was observed in the size of heads except for the degeneration of anthers and the absence of pollen grains; female plants had heads smaller than those of hermaphrodites. Recently Kadota (2006) made a brief report of the remarkable gynodioecy in *C. masami-saitoanum* from Kyushu, southern Japan; in female plants, 1) heads were more in number, 2) florets were deeper in color, 3) stem was well branched and the branches were elongated, 4) stigmata of florets turned out to be slightly open. However, female plants in *C. takahashii* had only sterile anthers and the differences in the head number, floret color, stem branching and stigma opening were not observed. Hence *C. takahashii* is considered to situate at the beginning of sexualization in the



Fig. 10. Holotype specimen of *Cirsium takahashii* Kadota (Shakadô, Yamagata-shi, Yamagata Pref., Honshu, 17 Sept. 2006, Y. Kadota 033501, TNS 727676).

TOHOKU

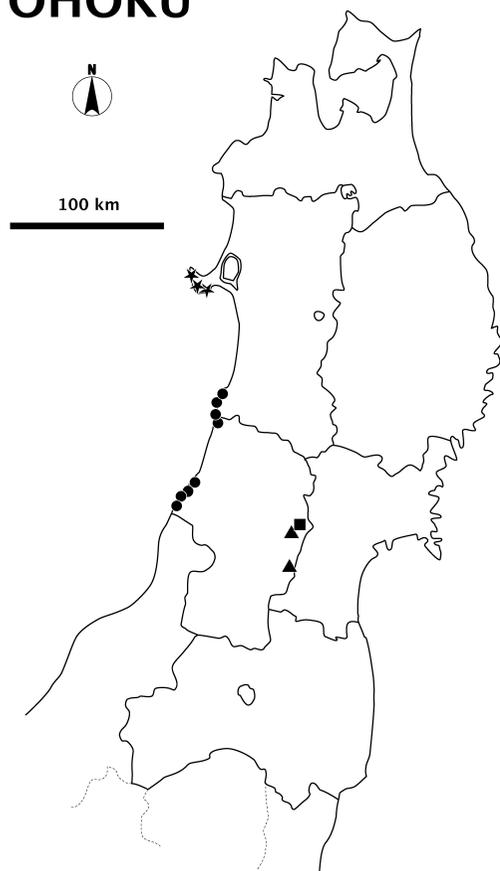


Fig. 11. Distribution of *Cirsium* species from the Tohoku District, northern Japan. Star. *C. togaense* Kadota. Disc. *C. domonii* Kadota. Square. *C. katoanum* Kadota. Triangle. *C. takahashianum* Kadota.

genus *Cirsium*.

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the locality of *C. katoanum*.

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