

Taxonomic Studies of *Cirsium* (Asteraceae) in Japan XIII. Three New Species from Tohoku District, Northern Japan

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Abstract Three new species of *Cirsium* are here described from Tohoku District, northern Japan. *Cirsium horiianum* is characterized by having nodding small capitula, larger lowermost cauline leaves at anthesis, deeply pinnate cauline leaves with sharp spines, narrowly cylindrical involucre, strongly incurved involucreal phyllaries without glandular bodies and the chromosome number $2n=34$ and is an endemic of Oga Peninsula, Akita Prefecture. *Cirsium uzenense* is characterized by having nodding small capitula, larger lowermost cauline leaves at anthesis, shallowly pinnate cauline leaves with weak spines, narrowly cylindrical involucre, broadly ovate involucreal phyllaries with well developed glandular bodies and the chromosome number $2n=34$ and is distributed in Yamagata, Miyagi and Niigata Prefectures. Both *C. horiianum* and *C. uzenense* belong to Sect. *Onotrophe* (DC.) Cass. Subsect. *Reflexae* (Kitam.) Kadota (the *C. kagamontanum* complex). *Cirsium ashinokuraense* is characterized by the absence of basal leaves at anthesis, oblique to suberect capitula, cylindrical involucre, recurved or patent involucreal phyllaries without glandular bodies and the chromosome number $2n=68$ and is also an endemic of Oga Peninsula, Akita Pref. A new subsection, subsect. *Ogapeninsulae*, is proposed for *C. ashinokuraense*. The subsect. *Ogapeninsulae* is a monotypic subsection.

Key words: *Cirsium ashinokuraense*, *Cirsium horiianum*, *Cirsium uzenense*, new taxa, subsect. *Ogapeninsulae*.

Introduction

In order to publish a monograph of Japanese *Cirsium* I have repeatedly executed field and herbarium examinations with the help of collaborators throughout Japan. Until now I have published the results of the analyses (Kadota and Nagase, 1988; Kadota, 1989–2004).

Subsection *Reflexae* (Kitam.) Kadota (1995; the *Cirsium kagamontanum* complex) is characterized by 1) numerous, small, nodding heads, 2) narrowly cylindrical involucre, 3) the absence of basal leaves and the presence of largest lowermost cauline leaves at anthesis, 4) the chromosome number $2n=2x=34$, and 5) the occurrence at mesic stands along streams in the *Fagus crenata* zone. The results of the study have revealed

that the *Cirsium kagamontanum* complex is widely distributed in Honshu and Shikoku and the complex includes a considerable number of undescribed species. Among them two new species from Tohoku District, Honshu, will be described here; the first from Oga Peninsula, Akita Prefecture, and the second from the Dewa and Ôwu Mountain Ranges, Yamagata Prefecture and its neighboring region.

In September of 2004 I had executed a field study again in Oga Peninsula in order to reconfirm the state of occurrence of the above-stated new species. At that time an unknown thistle was found in the Ashinokura-sawa Gorge of Mt. Kenashiyama, Oga Peninsula. This thistle is similar to the species belonging to the subsect. *Megaphylla* Kitam. (Kadota, 1995; e. g., *Cirsium*

yezoense (Maxim.) Makino common in Tohoku District, *C. suffultum* (Maxim.) Matsum. common in Kyushu and *C. lucens* Kitam. endemic to Mt. Shiraiwayama and Mt. Ichifusayama of the Kyushu Mountain Range) in the absence of basal leaves at anthesis and having medium-sized cylindric involucre. However, this thistle is significantly different from the three species in having suberect to oblique heads. In conclusion the thistle in concern will be described as a new species of a new subsection, which is endemic to the Ashinokura-sawa Gorge, Oga Peninsula, Akita Prefecture.

Taxonomic treatment

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

Subsect. **Reflexae** (Kitam.) Kadota, Fl. Jap. 3b: 148 (1995).

Cirsium horiiianum Kadota, sp. nov. [Figs. 1, 2]

Haec species *Cirsio tenuipedunculato* affinis est, sed a eo phyllariis exterioribus angusto ellipticis, folliis caulibus obovatis et acheniis eburneis distinguitur.

TYPE: JAPAN: Honshu; Akita Pref., Oga-shi, Oga Peninsula, Mt. Kenashiyama, Anabata-sawa Gorge, alt. 710 m, 26 September 2004, Y. Kadota 044013 (holotype–TNS 744509; Fig. 1).

A monoecious, perennial herb, 0.7–1.5 m or up to 2 m or more long. Root stock stout, horizontal, up to 1 cm in diameter, with cord-like roots. Stem declining, well branched in the upper part, covered with brownish multicellular hairs in the upper part and sparingly arachnoid. Basal leaves withering at anthesis. Middle cauline leaves dull green on the adaxial side, glaucous on the abaxial side, subcoriaceous to membranous, obovato-elliptic to narrowly obovato-elliptic in outline, deeply to medially pinnatilobate or rarely subentire and coarsely serrate, 15–50 cm long, 6–22 cm wide, provided with sharp spines 3–10 mm long, glabrous on both sides or pubescent with brownish short hairs along veins on the adaxial side, shortly petiolate, auriculate or not auriculate, not

deccurrent; lobes 5–7-jugate, narrowly ovate to ovate, 2–12 cm long, 1–2 cm wide. Flowers in September to October. Capitula nodding, several to numerous in a raceme or panicle; subtending leaf solitary, linear to narrowly lanceolate, ca. 1 cm long, provided with sharp spines ca. 2 mm long. Involucre narrowly cylindrical, not glutinous, 15–18 mm long, 5–7 mm (*in vivo*) and 15–25 mm (*in sicco*) in diameter, scarcely arachnoid. Phyllaries 9–11-seriate, herbaceous, terminated with sharp spines ca. 2 mm long; glandular bodies absent; outer phyllaries linear to narrowly ovate with strongly recurved caudate tips, 6–8 mm long. Corollae violet, 15–17 mm long; lobes 2–4 mm long; throats 6–7 mm long; tubes 7–8 mm long, as long as or slightly longer than the throats. Achenes ivory-white, 5–5.5 mm long, slightly ribbed; pappi sordid, 13–15 mm long.

Chromosome number: $2n=34$.

Japanese name: Oga-azami (nov.).

Distribution: Oga Mountains, Oga Peninsula, Akita Prefecture (Fig. 7, triangle). Endemic.

Specimens examined: JAPAN: Honshu; Akita Pref., Oga-shi, Oga Peninsula, Mt. Honzan, alt. 260 m, 8 Oct. 1997, Y. Kadota 975012–975029 (TNS 650463–650752); Oga-shi, Oga Peninsula, Mt. Kenashiyama, Anabata-sawa Gorge, alt. 710 m, 26 September 2004, Y. Kadota 044011–044012, 044014–044023 (TNS 744493–744521); Oga-shi, Oga Peninsula, Mt. Kenashiyama, Sugoroku Rindô, alt. 460 m, 26 September 2004, Y. Kadota 044125–044126 (TNS 744140, 744181–044126 (TNS 744140, 744181–744187)).

The specific epithet “*horiiianum*” is dedicated to Mr. Yûjirô Horii, the discoverer of this thistle.

Cirsium horiiianum occurs along summer green forests and streams in the mountains around only Anabata-sawa and Ashinokura-sawa Gorges of Oga Peninsula, Akita Prefecture.

Cirsium horiiianum is similar to *C. tenuipedunculatum* Kadota [= *C. effusum* auct. Jap. non Maxim.; cf. Kadota, 1997] in having strongly recurved involucre phyllaries, deeply pinnatilobate cauline leaves and the chromosome number $2n=2x=34$. However, the former is distinguished from the latter in the shape of outer in-



Fig. 1. Type specimen of *Cirsium horitianum* Kadota (JAPAN: Honshu; Akita Pref., Oga-shi, Oga Peninsula, Mt. Kenashiyama, Anabata-sawa Gorge, alt. 710 m, 26 September 2004, Y. Kadota 044013, TNS 744509, holotype).



Fig. 2. Habit of *Cirsium horitium* Kadota (JAPAN: Honshu; Akita Pref., Oga-shi, Oga Peninsula, Mt. Kenashiyama, Anabata-sawa Gorge, alt. 710 m, 26 September 2004). Left corner inset shows a close-up of a capitulum.

volucral phyllaries (narrowly ovato-elliptic with caudate tips vs. broadly ovate with caudate tips), the shape of middle cauline leaves in outline (obovato-oblong vs. ovato-oblong) and the color of achenes (ivory-white vs. reddish brown). Furthermore in *C. tenuipedunculatum* phyllaries are frequently provided with glandular bodies and/or spinules along the margin.

Cirsium tenuipedunculatum is known as an example of the Fossa Magna elements (Takahashi, 1971) and is restricted to the region from the western part of Kanto District to the eastern part of Chubu District on the Pacific Ocean side of central Honshu. On the other hand *C. horitanum* is an endemic of Oga Peninsula, on the Japan Sea side of northern Honshu (Fig. 2, triangle).

***Cirsium uzenense* Kadota, sp. nov.** [Figs. 3, 4]

Cirsium hanamakiense auct. non Kitam.: Nat. Hist. Shiroishi Miyagi Pref. 149 (1982)—Yuki, New Fl. Yamagata 277 (1992)—Kadota in Mem. Natn. Sci. Mus., Tokyo (29): 96 (1996), pro parte—Fl. Miyagi Pref. 249 (2001), pro parte.

Cirsium kagamontanum auct. non Nakai: Yuki, New Fl. Yamagata 278 (1992).

Haec species *Cirsio hanamakiense* et *C. kagamontano* affinis est, sed a *C. hanamakiense* phyllariis involucrium 10–11-seriatis, foliis caulibus magis latoribus et profunde pinnatilobatis; a *C. kagamontano* phyllariis recurvatis vel patentibus, vittis obovato-lanceolatis differt.

TYPE: JAPAN: Honshu; Yamagata Pref., Akumi-gun, Yawata-machi, Kami-Aosawa, River Ômatagawa, the Shimizubashi Bridge, alt. 260 m, 29 September 2004, Y. Kadota 044135 (holotype—TNS 744188–744191; Fig. 3).

A monoecious, perennial herb, 1–1.5 m or up to 2 m or more long. Root stock stout, horizontal, up to 3 cm in diameter, with cord-like roots. Stem declining, well branched in the upper part, covered with brownish multicellular hairs in the upper part and sparingly arachnoid. Basal leaves withering at anthesis. Middle cauline leaves dull green on the adaxial side, glaucous on the abaxial side, subcoriaceous, obovato-elliptic to broadly elliptic in outline, shallowly to medially pin-

natilobate, 15–60 cm long, 6–25 cm wide, provided with weak spines 1–2 mm long, glabrous on both sides or pubescent with appressed multicellular hairs on the abaxial side, more or less petiolate, not auriculate, not deccurrent; lobes 5–6-jugate, narrowly ovate to ovate, 1–12 cm long, 1–6 cm wide. Flowers in September to October. Capitula nodding, several to numerous in a raceme or a panicle; subtending leaf solitary or absent, if present, linear to narrowly lanceolate, ca. 1 cm long, provided with weak spines ca. 1 mm long. Involucres narrowly cylindrical, not glutinous, 14–15 mm long, 6–7 mm (*in vivo*) and 20–30 mm (*in sicco*) in diameter, scarcely arachnoid. Phyllaries 10–11-seriate, herbaceous, terminated with weak spines ca. 1 mm long, sometimes provided with spinules along the margin; glandular bodies narrowly obovato-lanceolate on the middle and inner phyllaries; outer ones broadly ovate with slightly recurved or patent tips, 3–4 cm long. Corollae violet, 10–17 mm long; lobes 4 mm long; throats 5–6 mm long; tubes 7–8 mm long, longer than the throats. Achenes grey-reddish brown, 4.5–5 mm long, minutely striate; pappi sordid, 12–14 mm long.

Chromosome number: $2n=2x=34$.

Distribution: Yamagata, Miyagi and Niigata Prefectures (Fig. 7, disc). Endemic.

Specimens examined: Yamagata Pref., Akumi-gun, Yawata-machi, Aosawa-goe, 7 Oct. 1996, S. Kato 7 (TNS 9027817); Aosawa-goe, alt. 280 m, 4 Oct. 1997, Y. Kadota 975035–975044 (TNS 651239–651249); Kami Aosawa, Omatagawa River, Shimizubashi Bridge, 1 Sept. 1999, S. Kato 99007–99009 (TNS); Shimizubashi Bridge, alt. 260 m, 29 Sept. 2004, Y. Kadota 044135–044137 (TNS 744188–744195); Kami Aosawa, Arakisawa, alt. 290 m, 29 Sept. 2004, Y. Kadota 044127 (TNS 744223); Kami Aosawa, Omatagawa River, Kazamabashi Bridge, alt. 300 m, 28 Sept. 2004, Y. Kadota 044129–044137 (TNS 744165, 744168–744179). Higashine-shi, Mt. Matsukurayama, 21 Sept. 1930, S. Okuyama 3095 (TNS 279732–279733); Sawatari, at the foot of Mt. Kurobushiyama, 21 Sept. 1986, S. Kato s. n. (TNS 707669). Nishi-Murayama-gun,



Fig. 3. Type specimen of *Cirsium uzense* Kadota (JAPAN: Honshu; Yamagata Pref., Akumi-gun, Yawata-machi, Kami-Aosawa, River Oatagawa, the Shimizubashi Bridge, alt. 260 m, 29 September 2004, Y. Kadota 044135, TNS 744191, holotype).



Fig. 4. Habit of *Cirsium uzenense* Kadota (JAPAN: Honshu; Yamagata Pref., Akumi-gun, Yawata-machi, Kami-Aosawa, alt. 300 m, 28 September 2004; courtesy of Mr. S. Miya). Left corner inset shows a close-up of a capitulum.

Asahi-machi, Asahi Kôsen (Mineral Spring), 22 Aug. 1931, H. Koidzumi s. n. (TNS 178976); Asahi Kosen, 30 Aug. 1999, S. Kato 99001–99002 (TNS). Yamagata-shi, Oku-Yamadera, 23 Sept. 1997, S. Domon s.n. (TNS 650182). Miyagi Pref., Katta-gun, Shichigashuku-machi, Watase, 10 Oct. 1977, Y. Ueno VE. 21361 (TNS 375012). Shiroishi-shi, Funabiki Rindo, 22 Aug. 1985, S. Kato 2 (TNS 707670). Niigata Pref., Iwafune-gun, Asahi-mura, Asahi SuperRindo, near Miomote Dam, 1 Sept. 1999, S. Kato 99003–99006 (TNS).

The specific epithet “*uzenense*” is derived from the word Uzen, an old name of Yamagata Prefecture, in which this thistle is mainly distributed.

Cirsium uzense occurs along summer green forests and streams in the Dewa and Ôwu Mountains (the southern part).

Cirsium hanamakiense Kitam. is most similar to *C. uzense* but the former is discriminated from the latter by having 8–9-seriate involucrel phyllaries and coarsely serrate or more shallowly pinnatifid middle cauline leaves. *Cirsium kagamontanum* Nakai is different from *C. uzense* in having appressed involucrel phyllaries and oblong glandular bodies on all the phyllaries.

Cirsium uzense is distributed throughout Yamagata Prefecture and in the northernmost part of Niigata Prefecture and the southernmost part of Miyagi Prefecture (Fig. 7). A close relative, *C. hanamakiense*, is distributed in Iwate, Akita, Miyagi and Yamagata (Mt. Gandosan, Yamagata-shi) Prefectures. (Kadota, 1996) neighboring in the north and the east to the distribution range of *C. uzense*. Another related species, *C. kagamontanum*, occurs in the region from Fukui to Niigata Prefectures which is located in the west of the range of *C. uzense* (Kadota, 2004c).

Literatures and type collection of *C. hanamakiense* are the followings:

Cirsium hanamakiense Kitam., Compos. Nov. Jap. 4 (1931); Acta Phytotax. Geobot. 3: 5 (1934); Compos. Jap. 1: 114 (1937); in Kitam. & al., Coll. Illust. Herb. Pl. Jap. 1: 39 (1980); in Satake & al., Wild Flow. Jap. 3: 220 (1981)—H. Hara, Enum. Sperm. Jap. 2: 173 (1948)—Ohwi, Fl. Jap. 1218 (1953); Fl. Jap. rev. ed. 1383

(1972); (Kitag.) New Fl. Jap. rev. 1534 (1983)—Masam., Col. Illust. Jap. 6-II: 327 (1974)—Sugim., Key Herb. Pl. Jap. 1: 662 (1978), p. p.—Kadota in Ono & al., Makinos Illust. Fl. Jap. 805, fig. 3220 (1989); Mem. Natn. Sci. Mus., Tokyo (29): 96 (1996), p. p.

TYPE: JAPAN: Honshu; Iwate Pref., Hanamaki-shi, between Dai Onsen (hot spa) and Hanamaki Onsen, 1 October 1930, S. Kitamura s. n. (holotype–KYO!; isotype–TNS 31332–31333!).

Japanese name: Hanamaki-azami.

Distribution: Iwate, Akita, Miyagi and Yamagata Prefectures.

Subsect. **Ogapeninsulae** Kadota, subsect. nov.

Herba perennis, foliis basalibus emarcidis sub anthesin, eis caulinis infimis grandioribus pinnatifidis, capitulis obliquis vel suberectis, involucri late cylindricis, phyllariis involucrorum patentibus vel recurvatis, numero chromosomatum $2n=4x=68$.

Type species: *Cirsium ashinokuraense* Kadota (see below).

A perennial herb; basal leaves withering at anthesis; lowermost cauline leaves larger, pinnatifid; capitula oblique to suberect; involucre broadly cylindrical; involucrel phyllaries patent to recurved; chromosome number $2n=4x=68$. Monotypic.

Cirsium ashinokuraense Kadota, sp. nov.

[Figs. 5, 6]

Herba monoecia perennis, 0.4–1 m alta. Caudex crassus horizontalis basi circiter 1 cm in diametro. Caulis suberectus vel ascendens fere glaber 2-vel 4-plo ramosus, ramis brevioribus non extensis. Folia basalia emarcida sub anthesin. Folia caulina infima atrocinerio-virides aliquantum carnosa, late elliptica vel late obovata, 27–35 cm longa, 14–18 cm lata, profunde vel leniter pinnatifida 5–7-jugatis angusto obovatis vel ellipticis 6–9 cm longis 1.5–3 cm latis spinis 1–3 mm longis, vel interdum grosse serrata et subintegra, utrinque glabra, petiolis 2–8 cm longis alatis basi leviter auriculatis. Flores in Septemberis. Capitula 3–4 in racemum pusillum



Fig. 5. Type specimen of *Cirsium ashinokuraense* Kadota (JAPAN: Honshu; Akita Pref., Oga-shi, Oga Peninsula, Mt. Kenashiyama, Ashinokura-sawa Gorge, alt. 320 m, 26 September 2004, Y. Kadota 044004, holotype, TNS 733968).



Fig. 6. Habit of *Cirsium ashinokuraense* Kadota (JAPAN: Honshu, Akita Pref., Oga-shi, Oga Peninsula, Mt. Kenashiyama, Ashinokura-sawa Gorge, alt. 320 m). Right corner inset shows a close-up of a capitulum.

laxum desposita, obliqua vel suberecta, pedunculis 0.5–2 cm longis sparse pubescentibus, folio subtento lineari 5–7 mm longo ad apicem spinoso circiter 1 mm longo. Involucra cylindrica eglutinosa, 17–18 mm longa, 10–15 mm (*in vivo*) et 13–20 mm (*in sicco*) in diametro, glabra vel interdum sparse arachnoidea. Phyllaria 8–9-seriata subcoriacea, spinis circiter 1 mm longis, vittis vestigiis lanceolatis vel linearibus, phyllariis interioribus lanceolatis 15–17 mm longis erectis, eis exterioribus ovatis caudatis 3–5 mm longis recurvatis vel patentibus. Corollae dilute violacea, 15–18 mm longa, lobis 4–5 mm longis, faucibus

5–7 mm longis, tubis circiter 8 mm longis. Achenia laete cinereo-brunnea, 4–4.5 mm longa, striata, pappi sorditis 13–15 mm longis. Numerus chromosomatum $2n=4x=68$.

TYPE: JAPAN: Honshu; Akita Pref., Oga-shi, Oga Peninsula, Mt. Kenashiyama, Ashinokurasawa Gorge, alt. 320 m, 26 September 2004, Y. Kadota 044004 (holotype–TNS 733968; Fig. 5).

A medium-sized, monoecious, perennial herb, 0.4–1 m tall. Rootstock stout, horizontal, ca. 2 cm in diameter, with cord-like roots. Stem suberect to ascending, simple or 1–4 times branched in the upper part, almost glabrous, striate, up to ca.

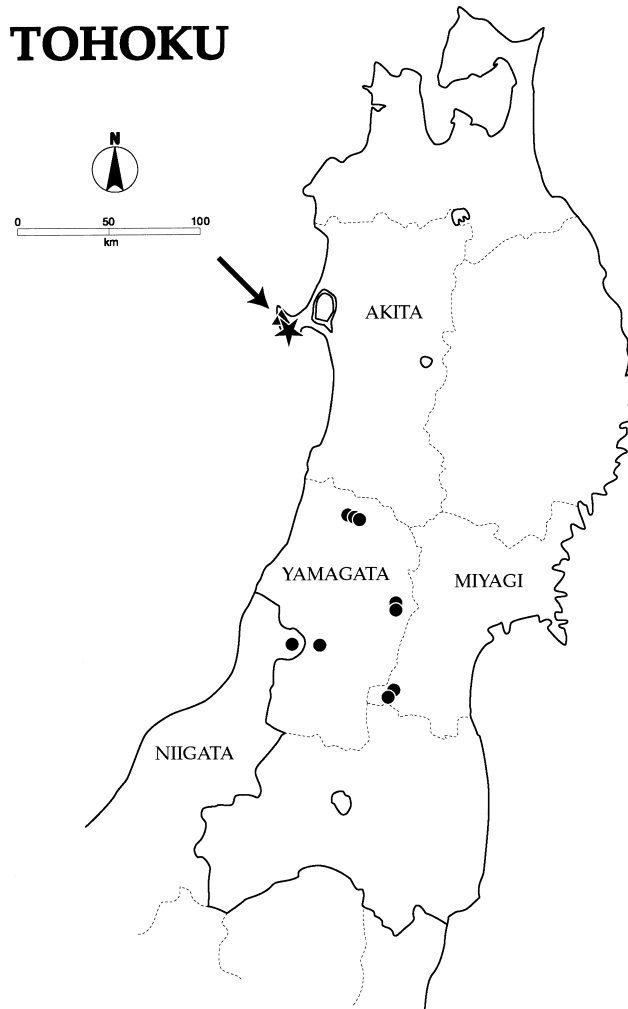


Fig. 7. Distribution of *Cirsium ashinokuraense* Kadota, *C. horiiianum* Kadota and *C. uzenense* Kadota. Star: *C. ashinokuraense*. Triangle: *C. horiiianum*. Disc: *C. uzenense*.

1.5 cm in diameter at the basal part. Basal leaves withering at anthesis. Lowermost cauline leaves dark grayish green above, somewhat fleshy, broadly elliptic to broadly obovate, 27–35 cm long, 14–18 cm wide, deeply or shallowly pinnatilobate to sometimes coarsely serrate and subentire, if pinnatilobate, 5–7-jugate with narrowly obovate to narrowly elliptic lobes 6–9 cm long, 1.5–3 cm wide, provided with weak spines 1–3 mm long along margin, glabrous on both sides; petioles 2–8 cm long, winged, slightly auriculate at base. Flowers in September. Capitula 3–4 in a loose, small raceme, oblique to suberect; peduncles 0.5–2 cm long, sparingly pubescent with brownish multicellular hairs or glabrous; subtending leaf solitary or absent, if present, linear, 5–7 mm long, provided with sharp spines ca. 1 mm long. Involucre cylindrical, not glutinous, 17–18 mm long, 10–15 mm (*in vivo*) and 13–20 (*in sicco*) in diameter, glabrous or sometimes sparingly arachnoid. Phyllaries 8–9-seriate, subcoriaceous, terminated with sharp spines ca. 1 mm long; glandular bodies lanceolate to linear, ca. 2 mm long, vestigial on the abaxial side of inner and middle phyllaries; inner phyllaries lanceolate, 15–17 mm long, erect; outer ones ovate with recurved to patent acuminate tips, 3–5 mm long. Corollae pale violet, 15–18 mm long; lobes 4–5 mm long; throats 5–7 mm long; tubes ca. 8 mm long, longer than the throats. Achenes light grayish brown, 4–4.5 mm long, striate; pappi sordid, 13–15 mm long. Chromosome number $2n=4x=68$.

Japanese name: Ashinokura-azami (nov.).

Distribution: Ashinokura-sawa Gorge, Oga Peninsula, Akita Prefecture (Fig. 7, star). Endemic.

Specimens examined: JAPAN: Honshu; Akita Pref., Oga-shi, Oga Peninsula, Mt. Kenashiyama, Ashinokura-sawa and Damino-sawa Gorges, alt. 320 m, 26 September 2004, Y. Kadota 044003–044004, 044006 (TNS).

This thistle grows on steep slopes under *Fagus crenata* forests in the Ashinokura-sawa Gorge, Oga Peninsula, Akita Prefecture.

Cirsium ashinokuraense has a unique charac-

ter state (the absence of basal leaves and the presence of larger lowermost cauline leaves, oblique or suberect heads and the chromosome number of $2n=4x=68$) as stated above. Hence the new subsection, Subsect. Ogapensisulae, is here established for this species. The tetraploid state suggests that this species may be evolutionarily advanced. However, this species is restricted to the two sites (Horii, pers. comm.) and only dozens of individuals were found there. *Cirsium ashinokuraense* is therefore regarded as a relict species.

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