

A NEW PALUDOSE THISTLE FROM CENTRAL JAPAN, *CIRSIIUM SHINANENSE*[※]

Tatemi SHIMIZU

清水建美: 新種ヤチアザミとその生態

In 1968, we carried out a phytosociological survey through the Sugadaira Moor in Central Japan. The first report of its results was published in the last year (Asano & al. 1969), in which some communities including *Cirsio-Alnetum* and *cirsietosum* were newly described. One of the characteristic species of them after which they were named was determined to be *Cirsium tanakae* (Fr. et Sav.) Matsum. on my own responsibility. However, recently I found out that this was not *C. tanakae*, but a singular new species. The present paper aims to describe this new thistle and to explain its morphological and ecological characters under comparison with those of the related species.

I am much indebted to Messrs. H. Okuhara, I. Hayashi and K. Tsuchida for their kind and various helps in the course of this study. I wish to express my hearty thanks to Dr. S. Kitamura and all the plant taxonomists of Kyoto University for their valuable suggestions and discussion about entity of this new species. Acknowledgement should be also due to the curator of the Herbarium of Kyoto University and of the National Science Museum of Tokyo for loan of the valuable material preserved therein.

Morphological characters

The new species hereby named *Cirsium shinanense* T. Shimizu is characterized by the radical leaves perished until the flowering time, the erect and shortly stalked heads a few in number (mostly 4~9 per stem) and the slender and patent involucre bracts (Fig. 1). So far as these morphological characters are concerned, it is very near to *C. inundatum* Makino. However, the former is different from the latter in having deeply pinnatifid lustrous leaves, short and thick stalks of the heads, and patent but shorter exterior bracts of the involucre. The leaves of *C. inundatum* are dull and usually merely dentate or else shallowly lobed, the stalks of the heads being long and slender, the involucre bracts erect and nearly equal in length. From *C. tanakae* (Fr. et Sav.) Matsum., with which I misidentified the present species in the previous paper (Asano & al. 1969), it is separated by absence of the radical leaves

※ The present work was carried out as a part of JIBP project.

Contribution from JIBP-CT No. 96.

Contributions from The Sugadaira Biological Laboratory No. 15.



Fig. 1 *Cirsium shinanense* in the Sugadaira Moor
(Photo. on Sept. 24, 1970)

at the flowering time and the lustrous and glabrous cauline leaves with greenish midribs. The leaves of *C. tanakae* are more or less hairy, not lustrous and usually reddish on the midrib, the radical leaves being persistent during the flowering season. The heads are too similar in appearance between both the species to be distinguished from each other. Ecologically *C. tanakae* is an inhabitant of rather dried grassland, whereas *C. shinanense* is always in marshy places, viz. moor, pond-side and stream-side. In this respect, another paludose thistle occurring in Central Japan, *C. sieboldi* Miq., might be considered here. But, unlike in *C. shinanense*, *C. sieboldi* is provided with radical leaves in the flowering season and characterized by scapiform habit and nutant heads in particular.

Consequently, *C. shinanense* is different from any of its related species in its morphological characters of the arial organs of the plant. However, it should be stressed that the present species was peculiar in regard to a character of the subterranean organ by which it was easily distinguished not only from these three species

above referred but also from any other kinds of *Cirsium* indigenous to Japan. As shown in Fig. 2, *C. shinanense* is provided with the horizontal long rhizomes. Several rhizomes stretch from the base of the current year's stem, sometimes extending to 25 cm long. The new radical leaves issue from their apices or nodes. So far as I have examined, the rhizome of *Cirsium* will usually obliquely and shortly grow and

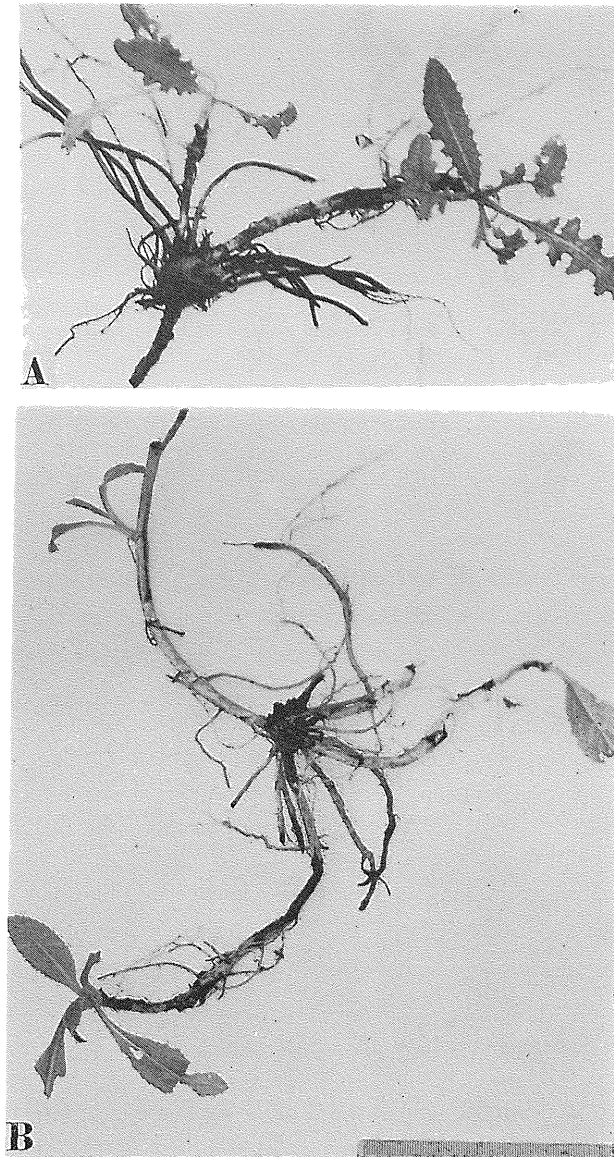


Fig. 2 Showing the elongated rhizomes of *Cirsium shinanense*
A: Sample from Sugadaira, T. Shimizu & K. Tsuchida 123
B: Sample from Iyari, T. Shimizu & K. Tsuchida 150A
× 1/3 (Cult. in Matsumoto; Photo. on Nov. 14, 1970)

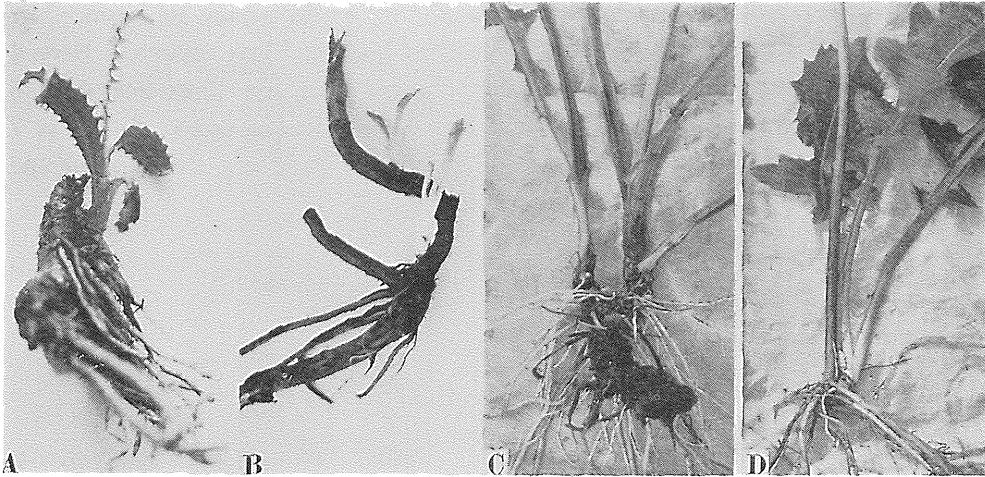


Fig. 3 Showing the subterranean organs of some Japanese thistles

- A: *Cirsium sieboldi* from Misaka $\times 2/5$
 B: *C. inundatum* from Kayanodaira $\times 2/5$
 C: *C. tanakae* in Sugadaira $\times 1/4$
 D: *C. nipponicum* in Sugadaira $\times 1/4$
 (A, B—Cult. in Matsumoto; Photo. on Nov. 14, 1970)
 (C, D—Photo. on Sept. 25, 1970)

enlarge, being never horizontal and elongated (Fig. 3). In this case the new radical leaves will appear at the base of the current year's arial stem. Because of such peculiarity, in my opinion, *C. shinanense* might well deserve a new sectional rank of the genus.

Taxonomic description

The following is the taxonomic description of the present new species. The specimens on which the horizontal rhizomes can be clearly detected will be asterisked (*). As shown in the specimen citation, it has been found to occur here and there in Nagano Prefecture and its vicinity. Some specimens have been confused with *C. tanakae* or *C. inundatum*, and some others have remained undetermined. Among the latter, I found a sheet of Dr. H. Koidzumi's collection, No. 34273, which was named "Yachi-azami" in Japanese by himself. This name will be adopted here.

Cirsium shinanense T. Shimizu, sp. nov. (Fig. 4 & Fig. 5)

Rhizoma longe repens. Caulis erectus, 40~150 cm altus. Folia radicalia sub anthesi emarcida, folia caulina media elliptica vel elliptico-lanceolata profunde pinnatifida vel bipinnatifida interdum tantum dentata, supra glabra nitida, subtus glabra vel sparse arachnoidea, basi amplexicaulia, laciniis marginibus spinuliferis, apice acuminatis spinis

1~2 mm longis praeditis. Capitula apices caulis et ramorum terminantia, erecta. Involucrum campanulatum, 15~18 mm longum, arachnoideum, squamae imbricatae haud reflexae, dorso eglutinosae, exteriores apice spinuliferae, interiores membranaceae apice vix spinuliferae. Corolla purpurascens, ca. 20 mm longa, pars angusta tubi ceteram aequilonga. Pappus 17 mm longus. Achenia oblonga, compressa, basi contracta. Nom. Jap.: Yachi-azami (H. Koidzumi, in sched.)

Specim. exam. Pref. Niigata: Suganuma, Yashiro-mura, Nakakubiki-gun, J. Yoshikawa 779 (KYO). Pref. Nagano: Kamiyama, at the side of Nojiri Lake, M. Furuse 98 (KYO); Sugadaira, Sanada-machi, Chiisagata-gun, 1200~1300 m, T. Shimizu & K. Tsuchida 124*—*holotype* (KYO), T. Shimizu & K. Tsuchida 120*~123* (SHIN), T. Shimizu 16715, 19059, 19089* & 19113 (SHIN), G. Murata & H. Koyama 54* (KYO); near Karuizawa Station, Karuizawa-machi, Kitasaku-gun, M. Furuse 57 (KYO); east side of Aoki Lake, Kitaazumi-gun, H. Koidzumi 27184 & 27200 (TNS); north side of Kizaki Lake, Kitaazumi-gun, H. Koidzumi 27183, 27192* & 27196 (TNS); around Kizaki Lake, Kitaazumi-gun, H. Koidzumi 27180 (TNS);



Fig. 4 *Cirsiium shinanense*, showing the pinnatifid leaves (Holotype) and the dentate leaves (T. Shimizu & K. Tsuchida 150B) $\times 3/10$



Fig. 5 A floret of *Cirsum shinanense* from the holotype specimen
×2.5

Iyari, east of Oomachi, ca. 800 m, T. Shimizu & K. Tsuchida 150A* (KYO, MAK, SHIN, TI, TNS), T. Shimizu & K. Tsuchida 150B* —cauline leaves merely dentate (KYO, SHIN, TI), K. Hirabayashi 6713 (SHIN); Iyari to Inao, north of Oomachi, 750~850 m, T. Shimizu 17737* (SHIN); Mt. Kamuriki, Sarashina-gun, 800~1250 m, T. Shimizu 17113 (SHIN); around Ooike Pond, south of Ubasute, Kōshoku-shi, T. Shimizu 17037 (SHIN); Kanzawa, Okada, Matsumoto, 680 m, K. Tsuchida 61* (SHIN); Fujii, east of Matsumoto, ca. 700 m, T. Shimizu & K. Tsuchida 179* (KYO, SHIN, TI); east of Shiojiri, Higa-shichikuma-gun, H. Koidzumi 27294 (TNS); Osawa, Kataoka-ku, Shiojiri, H. Okuhara 31 (KYO); Machimura, Kitakumai, Shiojiri, H. Okuhara 410 (SHIN); near Ichirizuka, east of Ono, Kamiina-gun, ca. 1000 m, T.

Shimizu & K. Tsuchida 169* (KYO, MAK, SHIN, TI, TNS); middle elevation of Mt. Takao, Okaya-shi, M. Mōri s. n. (KYO, SHIN, TI, TNS); Kamitsukinoki, Chino-shi, M. Furuse 80 (KYO); Oodaira, Shimosuwa, Suwa-gun, H. Koidzumi 34273 (TNS); Hara-mura, Suwa-gun, C. Kosaka 6*(TI).—marshy places such as moorland, pond-side, stream-side and rice field.

A perennial paludose herb with horizontal elongated rhizomes. Rhizomes several in number, up to 25 cm long and 7 mm across. Stems erect, 40~150 cm tall, branching, fistulose, sulcate, glabrous but slightly arachnoid on the upper part. Radical leaves lustrous, glabrous or sparsely hispid with multicellular patent hairs, perished until the flowering time. Cauline leaves elliptic or elliptic-lanceolate, 5~25 cm long, 3~15 cm wide, deeply pinnatifid or bipinnatifid sometimes merely dentate, amplexicaul at base, lustrous and glabrous above, glabrous or slightly arachnoid beneath; lobes narrow, up to 1 cm wide, acuminate, with apical spine 1~2 mm long, minutely and densely spinuliferous on margin. Heads shortly stalked, a few in number (1~) 4~9 (~15) per stem, erect. Involucres campanulate, arachnoid, 15~20 mm long and so across. Involucral bracts imbricate in 6~7 series, up to 1.5 mm wide, never glutinous; exterior lanceolate, somewhat thickened, spiny at apex, patent; interior membranaceous, acuminate toward apex, patent. Corolla purple, about 20 mm long, with slender tube about half in length. Fruiting pappus 17 mm long. Achenes oblong, 3.5~4 mm long, quadrangular, compressed, stramineous, somewhat contracted at base.

Chromosome counts

More than half of about one hundred kinds of the Japanese *Cirsium* have been chromosome-counted by Aishima (1934), Matsuura and Suto (1935) and Arano (1957, '63). According to them, the chromosome number shows multiples of 17, ranging from 34 to 102 in the diploid phase. For example, *C. inundatum* is $n=51$ (Aishima 1934) and *C. tanakae* is $n=17$ (Aishima 1934) or $2n=34$ (Arano 1957). As pointed out by Kitamura (1937), the chromosome number of the genus *Cirsium* is constant in the same subdivision as a whole. Subsect. *Sinocirsium* Kitam. including *C. tanakae* is represented by diploid species ($2n=34$), while Subsect. *Nipponocirsium* Kitam. is mostly consisted of tetraploids ($2n=68$) as exemplified by *C. nipponicum* (Maxim.) Makino and var. *incomptum* (Fr. et Sav.) Kitam.

Using the squash method of the root tip cells, I have also chromosome-counted with regard to some species of *Cirsium* including *C. shinanense*. The result is that *C. shinanense* was proved to be tetraploid, $2n=68$, regarding all the material examined (Fig. 6, A). Therefore, it is not only morphologically different from both the related species, *C. inundatum* and *C. tanakae*, but also in chromosome number. *C. sieboldi* the chromosomes of which had not been examined was newly counted and proved to be diploid, $2n=34$, basing upon the material from Misaka in Nagano Prefecture (Fig. 6, B). In addition, *C. tanakae* and *C. nipponicum* from Sugadaira were also examined. In this case, the result agreed with the previous counts. After all, so far as chromosome number is concerned, *C. shinanense* is same with *C. nipponicum*, and seems to be a member of Subsect. *Nipponocirsium*.

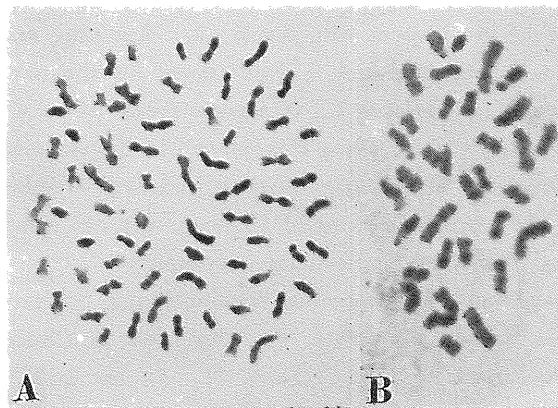


Fig. 6 Somatic chromosomes of *Cirsium shinanense* (A) and *C. sieboldi* (B)

A : Material from Iyari, T. Shimizu & K. Tsuchida 150A. B : Material from Misaka, H. Okuhara 430

× ca. 2200

All these results of chromosome counting are summarized in Table 1. The voucher specimens are all preserved in SHIN.

Table 1 Chromosome numbers of *Cirsium shinanense* and some other thistles

Species	2n	Locality	Voucher specimen	Previous counts & authority
<i>C. shinanense</i>	68	Sugadaira	T. Shimizu & K. Tsuchida 123	
—	68	Iyari	T. Shimizu & K. Tsuchida 150A	
—	68	Shiojiri	H. Okuhara 410	
<i>C. sieboldi</i>	34	Misaka	H. Okuhara 430	
<i>C. tanakae</i>	34	Sugadaira	T. Shimizu & K. Tsuchida 133	n=17 (Aishima 1934) 2n=34 (Arano 1957)
<i>C. nipponicum</i>	68	Sugadaira	T. Shimizu & K. Tsuchida 144	n=34 (Aishima 1934)

Ecological notes

As mentioned above, *C. shinanense* is strikingly characterized by the elongated horizontal rhizomes. According to Numata's reproductive type (Numata 1947, '50; Numata and Asano 1956, '59, '70), it is grouped into R₃ type which means the plant with rhizomes shorter than 10 times of the average height of its above-ground part. On the other hand, they regarded three kinds of *Cirsium*, i. e. *C. japonicum*, *C. microspicatum* and *C. nipponicum* var. *incomptum*, as the plant of R₅ type which means the plant of non-clonal growth (Numata and Asano 1970). Also, so far as I examined in the field and in the herbaria, all *Cirsia* of Japan excluding *C. shinanense* have no elongated rhizomes, being grouped into R₅ type (Fig. 2 & 3). In the case of *C. shinanense*, furthermore, new rhizomes will grow to be long and thick until the late autumn, when the new radical leaves will develop from the apex of them. Meanwhile, the current year's stem will perish after flowering and fruiting together with its subterranean organs, becoming a dead center for the new plants which will grow in the next year. Therefore, *C. shinanense* seems to be a winter annual and is grouped into "vegetatively propagating therophyte" in the sense of Numata and Asano likewise in the case of *Cacalia delphinifolia* and *Senecio nikoensis* (Numata and Asano 1959, '70). In the other cases of *Cirsium*, the old rhizomes are alive also in the next year and the plants are ordinary perennials.

The vegetation and some environmental conditions of *C. shinanense* were observed at three localities in Nagano Prefecture, viz. Sugadaira in Chiisagata-gun, Iyari in Oomachi-shi and Ono in Kamiina-gun (Table 2). In the table, the results of the vegetational research in 7 stations by the phytosociological method of Braun-Blanquet (1951) are shown, in which the plants recorded only in one station are omitted. *C. shinanense* is an inhabitant of the lowland moor lacking in *Sphagnum* and having *Alnus japonica*, *Astilbe microphylla*, *Carex rhynchophysa*, *Lycopus maackianus*, *The-lypteris palustris*, and so on. The close analysis of the vegetation for *C. shinanense*

Table 2 Habitat of *Cirsium shinanense*

Date	5/X	1/X		25/IX			
Locality	Ono	Iyari		Sugadaira			
Altitude (m)	1010	830		1300			
Area investigated (m ²)	2×5	5×10	5×5	2×3	5×20	5×5	5×5
Soil pH	5.0	5.0	5.0	5.7	/	/	5.6
Water table (cm)	-10	0	0	6	0	0	-10
Coverage (%)	100	100	100	100	100	100	100
Species number	29	42	35	14	11	14	11
Ap--As							
<i>Alnus japonica</i>							3.3
H							
<i>Cirsium shinanense</i>	3.3	3.3	1.2	5.5	5.5	3.3	2.3
<i>Astilbe microphylla</i>	+	1.3	1.2	+	+2	1.2	+
<i>Carex rhynchophysa</i>	2.3	+		2.3	3.4	5.5	5.5
<i>Lycopus maackianus</i>	1.2	1.3	+2	1.3	1.2	+2	
<i>Thelypteris palustris</i>	2.3	2.3	+3	1.3	+3	1.3	
<i>Calamagrostis epigeios</i>	+	+	+	+	+		
<i>Carex vesicaria</i>		2.3	2.3	+2	1.2	2.4	
<i>Scirpus wichurai</i>	1.3	1.2	1.2			1.2	+
<i>Alnus japonica</i>		1.3	1.3			+	+
<i>Epilobium pyrricholophum</i>		+3	+	+			+
<i>Galium gracilens</i>		+	+	+		+	
<i>Juncus effusus</i> v. <i>decipiens</i>	1.3			+	+	2.3	
<i>Impatiens textori</i>		1.2		+			1.2
<i>Malus sieboldii</i>	1.3		+				+
<i>Polygonum sagittatum</i> v. <i>sieboldii</i>	+2	1.2		+3			
<i>P. thunbergii</i>	1.2	2.4					3.4
<i>Scutellaria dependens</i>			+	+	+		
<i>Viola verecunda</i>	1.2	2.3	+				
<i>Acer ginnala</i>		+3	+				
<i>Artemisia montana</i>	1.2	+					
<i>Aster glehni</i> v. <i>hondoensis</i>	1.3		+				
<i>Carex biwaensis</i>	2.3	+					
<i>Glyceria leptolepis</i>		+3	+				
<i>Iris ensata</i> v. <i>spontanea</i>	1.3		+				
<i>Lysimachia vulgaris</i> ssp. <i>davurica</i>		1.2	+				
<i>Miscanthus sinensis</i>		1.3	+				
<i>Pilea hamaoi</i>						+	1.2
<i>Rosa luciae</i>	+2	1.3					
<i>Salix integra</i>	+	+					
<i>Stachys riederi</i> v. <i>intermedia</i>	1.3	+2					
<i>Thelypteris nipponica</i>					4.4		+
<i>Triadenum japonicum</i>			2.3	+			

in Sugadaira should be referred to our previous report (Asano & al. 1969).

References

- Aishima, T. (1934) Bot. Mag. Tokyo 48 : 150~151.
Arano, H. (1957) Jap. Jour. Gen. 32 : 323~332.
——— (1963) Bot. Mag. Tokyo 76 : 219~224.
Asano, K. & al. (1969) Sugadaira No. 3, 11~28.
Braun-Blanquet, J. (1951) Pflanzensoziologie 2 Aufl.
Kitamura, S. (1937) Compositae Japonicae I.
Matsuura, H. & T. Suto (1935) Jour. Fac. Sc. Hokkaido Univ. Ser. V (Bot.),
5 : 55~56.
Numata, M. (1947) Seibutsu 2 : 121~123.
——— (1950) Med. & Biol. 17 : 258~261.
——— & S. Asano (1956) Bot. Mag. Tokyo 69 : 141~145 & 509~513.
——— • ————— (1959) Bot. Mag. Tokyo 72 : 456~461.
——— • ————— (1970) Biological Flora of Japan. Introduction & Sympetalae I.

(Biological Institute & Herbarium, Faculty of Liberal Arts, Shinshu University,
Matsumoto, Japan)