

Itinerary of Expedition to the Southern Kuril Islands (2009–2012)

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Abstract Expedition to the southern Kuril Islands was conducted for the purpose to estimate present condition of fauna and flora of these islands. In 2009–2012, we visited Shikotan (2010), Kunashiri (2009, 2012) and Etorofu (2012) Islands under the arrangement of visa-free visit between governments of Japan and Russia. General outline of each expedition including plan, participants and studied localities are described.

Key words: Etorofu (Iturup), fauna, flora, Kunashiri (Kunashir), Shikotan, southern Kurils

Introduction

The Kuril Islands are a string of islands between Hokkaido and the Kamchatka peninsula. Because of its geographic position and unique biological condition as islands, its fauna and flora have been intensively studied by Japanese and Russian specialists (e. g. Miyabe 1890; Kudo 1922; Tatewaki 1957; Alexeeva 1983; Vorobiev 1956; Voroschilov 1985. See Takahashi 1996 for details). International Kuril Island Project (IKIP: <http://www.burkemuseum.org/static/okhotskia/ikip/>), held by three countries (USA, Japan, Russia), provided additional knowledge on its fauna and flora (e. g. Takahashi et al 1997, 2002; Barkalov 2000, 2009; Barkalov et al. 2009). At the same time, these studies revealed some problems on ecology of the islands, including presence of some invasive species, not native to these islands.

In 2009–2012, we had expeditions to Shikotan (2010), Kunashiri (2009, 2012) and Etorofu (2012) Islands of the southern Kuril Islands on the theme "joint research on the invasive species and rare & endangered species of the southern Kuril Islands" under the arrangement of visa-free visit between governments of Japan and Russia. One of the most important purpose of the expeditions was to survey ecological condition of these islands. During the study, we provided special attention to the rare and endangered species, as well as invasive species, which has potential risk to the ecological condition of the islands. In this itinerary we describe plan, participants and studied localities of these expeditions.

Itinerary

1. Expedition to Shikotan Island (Aug. 21 - 30, 2010)

[Participants]

From Japan: TAKAHASHI Hideki (T), SATO Hiroyuki (S), ABE Tsuyoshi (A), NOBETSU Takahiro (N), FUKUDA Tomoko (F).

From Russia: ANTIPIN Maxim, LOGUNTSEV Andrei, TARAN Alexandr, ALEKHIN Alexandr, CHABANENKO

Svetlana.

[Summary]

From the base village of Krabozavodskoye, we visited Mt. Shikotan, Tserkovnaya Bay, Mt. Ploskaya, E coast of the Island and Mt. Otradnaya. The expedition was basically conducted by two groups - land group (T, S, F) and sea group (A, N). We visited several times Mt. Shikotan, the highest mountain of this island (alt. 412m). To visit Mt. Ploskaya and Tserkovnaya Bay of the west of the island, where no roads for cars, we used caterpillar truck. Plant surveys were conducted by observation with photographs. Details are as in Table 1 and Fig. 1.

2. Expedition to Kunashiri (Kunashir) Island (Oct. 20–29, 2009)

[Participant]

TAKAHASHI Hideki (T)

[Summary]

Expedition was conducted at NE part of the Kunashiri Island, mainly around rivers Saratovskaya and Tyatina, whose river mouth on Pacific ocean side. Details are as in Table 2 and Fig. 3.

3. Expedition to Kunashiri & Etorofu (Iturup) Islands (Aug. 17–Sept. 10, 2013)

[Participants]

From Japan: TAKAHASHI Hideki (T), KATO Yukie (KY), SATO Hiroyuki (S), ABE Tsuyoshi (A), NOBETSU Takahiro (N), KOBAYASHI Takahito (KT), FUKUDA Tomoko (F)

From Russia: ANTIPIN Maxim, LOGUNTSEV Andrei, BOBYR Igori, BUDAEV Aleksandr (for Kunashiri)

GULIN Nikolai, KUPRIN Stanislav (for Etorofu)

[Summary]

The first half of the program in Kunashiri Island was based at Andreyevka watchhouse. From the base, we visited the Cape of Chetverikova, Semovodsk, SE wetland of Lake Peschanoye, Okhotsk seashore N of the lake, Lake Goryacheye, the Cape of Veslo, Stolbchatyy and Lake Aliger. Then we came back to Yuzhno-Kuril'sk, and visited Lake Serebryanoye and the Cape of

Sukacheva. Part of the participants moved to Iturup Island on 24 Aug., and other part of participants conducted expedition along Stolbovskyy road at Okhotsk coast around Tret'yakovo and Lake Serebryanoye.

In Etorofu Island, we visited Tornaya, Sof'a and Dobrynina - N bays on Okhotsk sea coast by boat from Reydovo.

After we came back to Kuril'sk, we visited lakes around Pioneer (Kuybyshevskoye, Maloye and other ponds), Reydovo, Kasatka

Bay, Lakes Bragodatnoye and Sredneye, Osennyya River, foot of Mt. Baranskogo, and along the road from Kuril'sk to Pioneer. Expedition to Mt. Atsonupuri was not conducted because of the bad sea condition for boating. Details are in Table 3 & 4, Fig. 2 & 3.

As a result of this expedition we confirmed ca. 500 plant species, ca. 40 species of fungi, ca. 45 species of algae and ca. 30 species of fishes.

Table 1. Program of expedition to Shikotan, Aug. 21–30, 2010.

Date	Locality	Attended:	Latitude	Longitude	No.
Aug. 21	Left from Nemuro port. Stayed off the coast of Yuzhno-Kuril'sk (Furukamappu).	all	44° 01' 09"	145° 50' 35"	
Aug. 22	Arrived at Krabozavodskoye (Anama) . Work at NE part of Krabovaya Bay (Anama-wan) . Work along forest path at SW part of Krabovaya Bay. Work along seashore at SW part of Krabovaya Bay. Work at south seashore of Otradnaya Bay.	all	43° 49' 43" 43° 49' 43" 43° 48' 42" 43° 49' 23" 43° 51' 28"	146° 44' 36" 146° 44' 50" 146° 44' 44" 146° 44' 58" 146° 47' 52"	1-1 1-2 1-3 2
Aug. 23	Work around village Krabozavodskoye. Work at Mt. Shikotan (Shakotan-yama) taking S route. Work at village Malokuril'skoye (Shakotan-mura).	all	43° 52' 10"	146° 51' 32"	3 4-1
Aug. 24	Work at Dimitrova Bay (Inemoshiri-wan). Work at a mountain pass from Dimitrova Bay to Malokuril'skoye. Work at NW part of Mt. Shikotan. Work around village Krabozavodskoye.	all	43° 48' 17" 43° 49' 10" 43° 52' 38"	146° 49' 59" 146° 49' 09" 146° 51' 03"	5 6 4-2 3
Aug. 25	Work at Tserkovnaya Bay (Matsuga-hama) . Work at field station of Tserkovnaya Bay. Work at Larix forest (Shikotan-matsubara) at W of Tserkovnaya Bay. Work along the way from Tserkovnaya Bay to Krabozavodskoye.	all	43° 44' 24" 43° 44' 09" 43° 43' 34" 43° 46' 01"	146° 41' 23" 146° 41' 08" 146° 40' 30" 146° 42' 42"	7-1 7-2 8 9
Aug. 26	Work at Mt. Ploskaya (Masuba-yama, or Okkaibetsu-yama) . Work at Zvezdnaya Bay (Masuba-wan). Work around village Krabozavodskoye.	T, S, F A, N	43° 47' 56" 43° 46' 17"	146° 39' 28" 146° 36' 14.5"	10 11 3
Aug. 27	Work at Chiboi (Chiboi-hama). Work at S seashore of Krab cape (Kurappu-misaki) . Work around light house of Krab cape. Work at N coast from Krab cape. Work at Kray Sveta cape (Etannotto-misaki) .	all	43° 49' 50.2" 43° 49' 50" 43° 50' 11" 43° 50' 24" 43° 50' 49"	146° 54' 16.8" 146° 54' 17" 146° 55' 08" 146° 54' 39" 146° 54' 51"	12 13-1 13-2 13-3 13-4
Aug. 28	Work at Mt. Shikotan, taking NW route. Work around village Krabozavodskoye.	all	43° 52' 14"	146° 51' 09"	4-3 3
Aug. 29	Work at NE part of Mt. Otradnaya (Matakotan-yama). Work at NE part of Mt. Otradnaya. Work at NE part of Mt. Otradnaya. Work around village Krabozavodskoye. Left from Krabozavodskoye.	all	43° 51' 43" 43° 51' 44" 43° 51' 56"	146° 45' 47" 146° 45' 51" 146° 46' 29"	14-1 14-2 14-3 3
Aug. 30	Stayed off the coast of Yuzhno-Kuril'sk. Returned to Nemuro.	all			

Table 2. Program of expedition to Kunashiri, Oct. 20–30, 2009.

Date	Locality	Attended:	Latitude	Longitude	No.
10/20	Left Nemuro port to Kunashiri, arrived off the Yuzhno-Kuril'sk.	T			
10/21	Landed on Yuzhno-Kuril'sk (Furukamappu) . Meeting at the Nature Reserve Center. Left Yuzhno-Kuril'sk. Remontnyu Cape (Kinakai-zaki) Arrived at the watchman hut of Saratovskaya River (Seoi-gawa)	T	44° 2' 25.2" 44° 6' 38.7" 44° 15' 56.9"	145° 51' 33.9" 145° 53' 57.7" 146° 6' 23.2"	15 16 17
10/22	Between Saratovskaya River and Tyatina River (Onnebetsu-gawa) . Mouth of Tyatina River Bear Observation site at Tyatina River	T	44° 16' 3.3"	146° 9' 14.3"	18-1
10/23	Around Saratovskaya River. Toisusu trees site.	T	44° 16' 13.0"	146° 9' 29.6"	18-2
10/24	Between Saratovskaya River and Tyatina River. Around Saratovskaya River.	T			

10/25	Around Saratovskaya River.	T			
10/26	Between Saratovskaya River and Tyatina River. Around Saratovskaya River.	T			
10/27	From Saratovskaya River to Yuzhno-Kuril'sk. Between Yuzhno-Kuril'sk and Mendleyevo airport.	T			
10/28	Friendship House of Yuzhno-Kuril'sk. Several points around the city Yuzhno-Kuril'sk. Okhotsk Sea side, N of Mt. Geyzery (Rausu-yama)	T	44° 1' 39.6"	145° 51' 34.7"	15
10/29	From Yuzhno-Kuril'sk to Nemuro port.	T	44° 1' 56.4"	145° 42' 8.0"	19

Table 3. Program of expedition to Kunashiri, Aug. 17–27, 2012.

Date	Locality	Attended:	Latitude	Longitude	No.
8/17	Left Nemuro port to Kunashiri, arrived at Yuzhno-Kuril'sk (Furukamappu).	all			
8/18	Start from Yuzhno-Kuril'sk to the mouth of River Andreyevka. Collection at Cape Chetverikova. Collection between Cape Chetverikova and a watchhouse at the mouth of River Andreyevka. Collection between a watchhouse at the mouth of River Andreyevka and the wet meadow on the hill. Collection at coastal meadows around Semovodsk. Collection at wet meadows at SE of Lake Peschanoye(Tofutsu-ko). Collection between wet meadows at SE of Lake Peschanoye and a watchhouse at the mouth of River Andreyevka.	all	43° 53' 16.1" 43° 53' 3.5" 43° 53' 16.1" 43° 53' 22.77" 43° 54' 28.4" 43° 54' 54.1"	145° 37' 28.1" 145° 37' 22.5" 145° 37' 28.1" 145° 37' 28.10" 145° 38' 50.9" 145° 38' 32.8"	20-1 20-2 20-3 21 22
8/19	Collection between wet meadows at SE of Lake Peschanoye and a coastal meadows at NW of Lake Peschanoye. Collection at coastal meadow, NW of Lake Peschanoye Collection along the sea coast between NW of Lake Peschanoye and Cape Znamenka (Nihon-iwa). Collection between NW and SE of Lake Peschanoye.	all	43° 56' 59.6" 43° 56' 35.7"	145° 35' 15.5" 145° 33' 39.4"	23-1 23-2
8/20	Collection between the entrance of climbing route to Mt. Golovnino (Tomari-yama) and Lake Goryacheye(Ichibishinai-ko). Collection at S coast of Lake Goryacheye.	all	43° 49' 43.7" 43° 51' 48.5"	145° 33' 07.9" 145° 30' 37.1"	24-1 24-2
8/21	Collection at E of Lake Veslovskoe, meadows and lakeside. Collection between Lake Veslovskoe and Cape Veslo(Keramui-zaki). Collection at Cape Veslo. Collection at N of Lake Veslovskoe.	all	43° 43' 10.8" 43° 42' 31.8" 43° 39' 10.7" 43° 43' 48.8"	145° 33' 23.3" 145° 33' 34.5" 145° 32' 41.4" 145° 33' 32.6"	25-1 25-2 25-3 25-4
8/22	Collection around a watchhouse at the mouth of River Andreyevka Collection at coniferous-broadleaved forests, W of a watchhouse. Collection between 13km village(Yaitai-kotan) and Cape Stolbchatyy (Zaimoku-iwa). Collection at Cape Stolbchatyy. Collection at NW side of Lake Aliger (Arigeru-ko). Collection at sea coast, W of Lake Aliger. Seacoast at W of Lake Legunnoye(Nikishoro-ko).	all	43° 52' 46.26" 44° 01' 32.1" 44° 02' 49.6" 44° 02' 55.8" 44° 03' 33.3"	145° 36' 27.03" 145° 40' 35.8" 145° 44' 25.3" 145° 44' 20.4" 145° 44' 47.8"	20-1 20-4 19 26 27-1 27-2 28
8/23	Collection at Yuzhno-Kuril'sk, Lake Serebryanoye(Furukamappu-numa). Collection at Cape Sukacheva (Chikappunai).	KY, S, KT A, N	44° 03' 05.69" 44° 04' 41.66"	145° 49' 18.51" 145° 52' 48.07"	29-1 30
8/24	Move to Iturup by ship "Etopirika". W of village Goryachiy Plyazh(Seseki), along branch of Lesnaya River (Shojin-gawa).	T,A,N,K,T,F KY, S	43° 59' 57.60"	145° 46' 04.94"	31 29-3
8/25	Collection at Stolbovskyy Ecological Road. Collection at S coast of Cape Stolbchatyy (Shimanobori-kaigan). Collection along coastal line from S coast of Cape Stolbchatyy to Tret'yakovo (Chibukaribetsu).	KY, S	44° 00' 25.91" 44° 00' 42.0" 43° 59' 22.36"	145° 40' 59.94" 145° 40' 37.8" 145° 38' 59.15"	31-1 31-2 31-3
8/26	Collection at Yuzhno-Kuril'sk, Lake Serebryanoye.	KY, S	44° 03' 24.21"	145° 50' 14.88"	29-2
8/27	Return to Nemuro port.				

Table 4. Program of expedition to Etorofu, Aug. 25–Sep. 10, 2012.

Date	Locality	Attended:	Latitude	Longitude	No.
8/25	Landed on Kitvyy (Nayoka). Move to Kuril'sk (Shana).	T,A,N,KT,F	45° 13' 38.8"	147° 52' 59.6"	32
8/26	Move from Kuril'sk via Reydovo (Bettobu) to Bay of Tornaya (Toro) by a boat. Landed on Tornaya. Collection at Bay of Sof'a (Sokiya)	T,A,N,KT,F	45° 16' 42.7" 45° 19' 40.1" 45° 23' 17.8"	148° 01' 06.4" 148° 25' 17.3" 148° 28' 50.0"	33 34-1 35
8/27	Collection at Bay of Dobrynya (Otoimaushi). Collection at Bay of Senokosnaya (Shimonaibo-gyojo).	T,A,N,KT,F	45° 21' 38.6" 45° 20' 40.1"	148° 27' 39.9" 148° 25' 48.4"	36 37
8/28	Collection at side of Lake Sopochnoye (Toro-numa). Collection at the subalpine meadows beteen Bay of Tornaya and Senokosnaya. Collection at hill ridge, NE side of Lake Sopochnoye. Collection around the camp site at Bay of Tornaya.	T,A,N,KT,F	45° 19' 20.5" 45° 20' 02.3" 45° 19' 35.5"	148° 24' 43.6" 148° 25' 16.7" 148° 25' 26.3"	34-2 34-3 34-4
8/29	Move from Bay of Tornaya via Bay of Parusnaya (Porosu) through Vetrovoy Peresheyek (Rucharu-bara) to the Pacific side (Higashi-rucharu). Collection at Pacific side of Vetrovoy Peresheyek. Work at Balye skaly (Bira-gyojo). Work at Chernyye skaly (Biyonotsu-gyojo). Work at 9km lot (Tokochiya-gyojo).	T,A,N,KT,F	45° 13' 22.2" 45° 16' 07.8" 45° 15' 31.6" 45° 15' 22.3"	148° 19' 23.6" 148° 15' 17.6" 148° 10' 05.5" 148° 08' 05.5"	38 39-1 39-2 39-3
8/30	Collection at Lake Kuybyshevskoye (Rausu-numa). N of Lake Maloye (Rubetsu-numa). S of Lake Maloye. Collectin at a small pond around Pioneer (Rubetsu). N coast (Benten-jima) of Lake Kuybyshevskoye. Collection at small ponds around Pioneer. Collection along Kuybyshevskoye River (Rubetsu-gawa).	T,A,N,KT,F	45° 04' 01.3" 45° 05' 09.9" 45° 04' 33.4" 45° 05' 26.0" 45° 04' 55.1" 45° 05' 45.1" 45° 05' 48.2"	147° 40' 07.7" 147° 41' 41.8" 147° 42' 27.6" 147° 41' 53.2" 147° 39' 44.1" 147° 42' 36.4" 147° 42' 05.3"	40-1 40-2 40-3 40-4 40-5 40-6
8/31	Specimen work at Kuril'sk.	T,A,N,KT,F			
9/1	Collection within the city of Kuril'sk. Collection at Bay of Olya (Ohyo), N of Reydovo (Bettobu). Collection at several places around Reydovo. S of Lake Reudovoye (Seseki-numa), around River Mineralnaya (Onsen-gawa).	T,A,N,KT,F	45° 17' 17.8" 45° 16' 33.6" 45° 16' 21.1" 45° 16' 05.0" 45° 15' 53.2" 45° 14' 31.4" 45° 14' 48.0"	148° 00' 46.3" 148° 01' 22.5" 148° 01' 22.7" 148° 01' 35.9" 148° 02' 28.7" 148° 00' 49.8" 148° 00' 49.4"	32 33
9/2	Move to Zaliv Kasatka (Hitokappu-wan), collection around Chertova skala (Rakko-jima). Collection around the central part of the coastal sanddune of Zaliv Kasatka. Collection between Lake Sredneye (Rebun-numa) and N lake (Yanke-numa). N coast of Lake Sredneye. Collection at Lake Bragodatnoye (Toshimoi-ko). Collection at Wetland with <i>Larix</i> , N of Lake Sredneye. Collection at riverside within Kuril'sk.	T,A,N,KT,F	44° 57' 38.8" 44° 59' 03.6" 44° 58' 32.0" 44° 58' 23.8" 45° 01' 01.3" 45° 00' 14.7"	147° 37' 03.5" 147° 38' 21.2" 147° 44' 06.1" 147° 44' 10.8" 147° 43' 04.9" 147° 43' 39.6"	41-1 41-2 42-1 42-2 42-3 42-4
9/3	Specimen work at Kuril'sk.	T,A,N,KT,F			
9/4	Collection at the mouth of River Osnnyaya (Oito). Collection at three sites between River Osennaya and Pioneer (Rubetsu).	T,A,N,KT,F	45° 00' 35.5" 45° 00' 05.8" 45° 00' 12.1" 45° 01' 11.3"	147° 31' 31.4" 147° 34' 59.9" 147° 35' 45.9" 147° 39' 08.4"	43-1 43-2 43-3 43-4
9/5	Move to Mt. Baranskogo (Sashiusu-yama), sulphur volcanic site. Collection at river hot spring. Collection at <i>Betula ermanii</i> forests on the pass. Collection at <i>Quercus crispula</i> forests at lower altitude.	T,A,N,KT,F	45° 05' 34.2" 45° 04' 38.7" 45° 06' 24.5" 45° 10' 29.4"	147° 59' 19.7" 147° 59' 11.0" 147° 59' 06.6" 147° 57' 12.9"	44-1 44-2 44-3 44-4
9/6	Collection at several sites between Rybaki (Arimoi) and Pioneer. Collection at <i>Quercus crispula</i> forest, S of Kuril'sk. Collection at the side of Lake Lebednoye (Shana-numa). Collection at the suburbs of city of Kuril'sk.	T,A,N,KT,F	45° 10' 35.7" 45° 10' 02.6" 45° 07' 50.5" 45° 06' 39.9" 45° 12' 24.2" 45° 13' 44.1" 45° 13' 28.9"	147° 47' 43.6" 147° 47' 43.0" 147° 47' 03.5" 147° 44' 12.9" 147° 54' 33.1" 147° 54' 40.5" 147° 53' 52.2"	45-1 45-2 45-3 45-4 45-5 45-6 45-7

9/7	Specimen work at Kuril'sk.	T,A,N,K,T,F			
9/8	Collection at the suburbs of city of Kuril'sk.	T,A,N,K,T,F	45° 13' 28.4"	147° 53' 13.5"	32
9/9	Going aboard a ship "Etopirika" at Kitovyy.	T,A,N,K,T,F	45° 13' 30.7"	147° 53' 39.7"	32
			45° 15' 25.9"	147° 53' 05.1"	
9/10	Procedures at "Etopirika" off Yuzhno-Kuril'sk, Kunashir. Return to Nemuro port.	T,A,N,K,T,F			

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Fig. 1. Map of Shikotan Island, with localities of expedition (circle with locality numbers, as in table 1 of program).

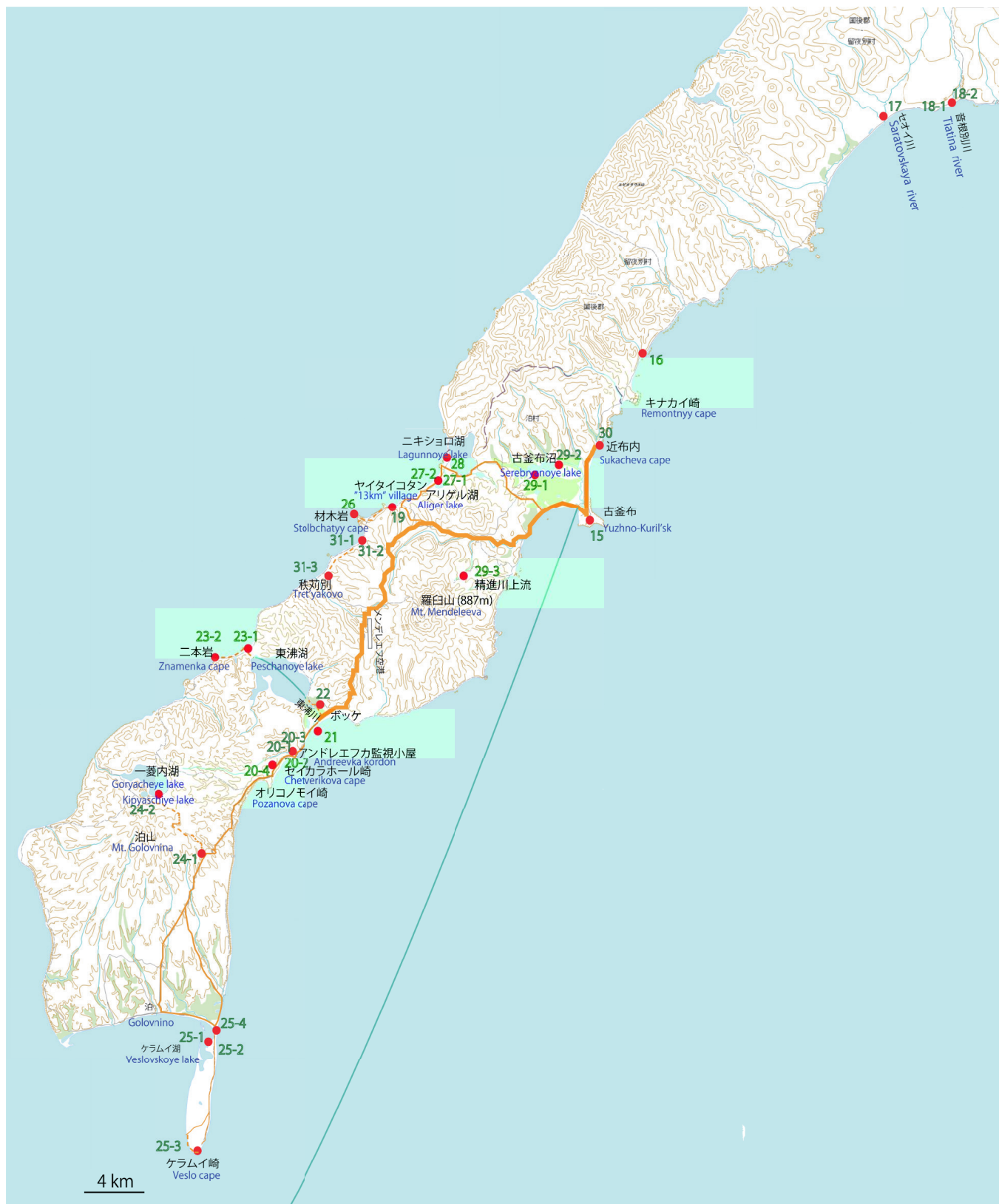


Fig. 2. Map of a part of Kunashiri (Kunashir) Island, with localities of expedition (circle with locality numbers, as in table 2 & 3.

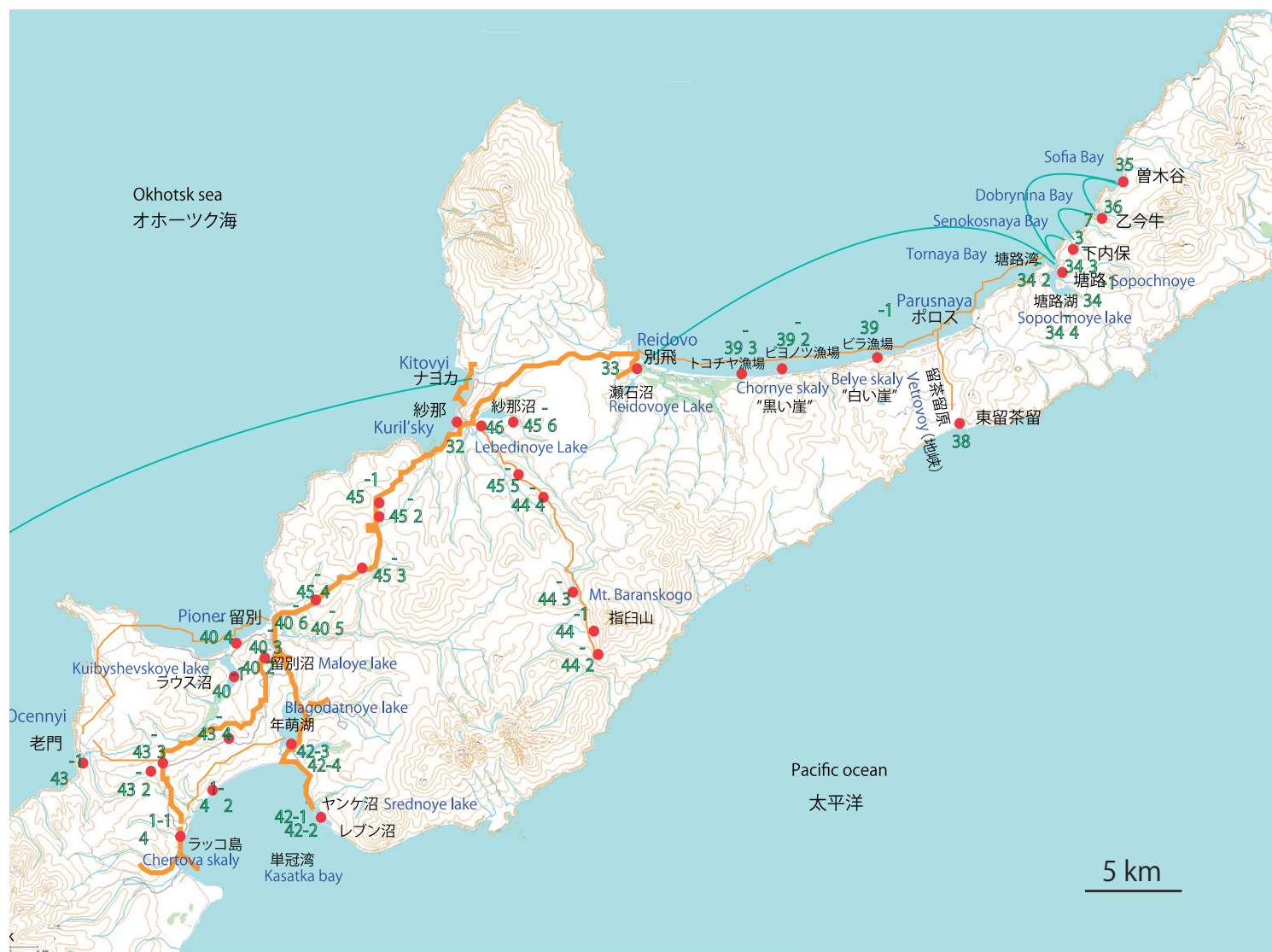


Fig. 3. Map of a part of Iturup (Etorofu) Island, with localities of expedition (circle with locality numbers, as in table 4 of program).

Alien plants collected or confirmed on the islands of Shikotan, Kunashir and Iturup on the 2009–2012 Botanical Expeditions

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Abstract Alien plants collected or confirmed by photographs during the 2009-2012 botanical expeditions to the islands of Shikotan, Kunashir and Iturup were reported. In all, 21 alien plants were newly found from these islands: *Aegopodium podagraria* L., *Daucus carota* L. subsp. *carota*, a double-flowered form of *Achillea ptarmica* L., *Rudbeckia laciniata* L. var. *hortensis* L.H.Bailey, *Solidago gigantea* Aiton subsp. *serotina* (Kuntze) McNeill, *Tanacetum vulgare* L. var. *vulgare*, *Echium vulgare* L., *Symphytum ×uplandicum* Nyman, *Brassica napus* L., *Cakile edentula* (Bigelow) Hook., *Saponaria officinalis* L., *Chenopodium ficifolium* Sm., *Lupinus polyphyllus* Lindl. *Melilotus officinalis* (L.) Pall. subsp. *suaveolens* (Ledeb.) H. Ohashi, *Trifolium campestre* Schreb., *Hypericum perforatum* L. *Mentha ×gracilis* Sole, *Oxalis dillenii* Jacq., *Anthoxanthum odoratum* L. subsp. *glabrescens* (Čelak.) Asch. et Graebn., *Elytrigia repens* (L.) Desv. ex B.D.Jackson var. *aristata* (Doell) Prokud. and *Lolium perenne* L. All the alien plants reported to date, including those we found, were analyzed in an invasive period and with a geographical relationship. Some details were determined for the especially harmful invasive species found during our expedition: *Rudbeckia laciniata* L., *Solidago gigantea* Aiton, *Cakile edentula* (Bigelow) Hook., and *Aegopodium podagraria* L.

Key words: alien, *Cakile edentula*, Iturup, Kunashir, Kuril Islands, *Rudbeckia laciniata*, Shikotan,

Introduction

Some alien species are harmful to native species, and the mechanism behind their interaction has been discussed from many angles (e.g. Gurevitch and Padilla, 2004; Traveset and Richardson, 2006). Didham et al. (2005) suggested that ultimate causes of population decline by invasive plants are species specific and context dependent. Pyšek et al. (2004) noted that checklists of alien plant species with reliable information of identification and status are indispensable to consider the problem of alien plants. Such a checklist will necessary in understanding regional flora, as well as to support and promote ecological research, which will help to consider the conservation problems of the locality.

Many studies have been carried out on alien plants in Japan (Osada 1972, 1976, Tachikake 1998, Shimizu, N. et al. 2001, Shimizu, T. 2003, Uemura et al. 2010). A manual and list of the alien plants have also been published in Hokkaido (Igarashi 2001, Hokkaido 2010). However, comparatively few studies have been carried out on the alien species of the Kuril Islands.

The presence of alien plants on these islands has already been noted by Tatewaki (1957), Barkalov (2009) and others. However, many of these works aimed to clarify the entire flora of the islands, and information on alien plants, its status and their distribution ranges are described fragmentally. In order to understand the ecological status of the islands, it is necessary to identify alien species, their characteristics, the period of invasion, and their present status in the regional flora.

During 2009 – 2012, we went on expeditions to the Shikotan (2010), Kunashir (2009, 2012) and Iturup (2012) Islands of the southern Kuril Islands on the theme "joint research on the invasive species and rare & endangered species of the southern Kuril Islands". During the study, we had the chance to study the ecological condition of the islands, including the situation of alien species. We considered the period of these species' introduction according to the literature and compared floristic similarity to neighboring territories. On the basis of our results, we gave special attention to some invasive species that might have harmful effects to the native vegetation of these islands.

Materials and Methods

We investigated alien plants at several places on Shikotan in 2010, Kunashir in 2009, 2013, and Iturup in 2013. The places investigated included natural meadows and forests, and vacant or disturbed places around and within the settlements of these islands.

A list of alien plants collected and confirmed in these islands is presented in this paper. Family and species names generally follow Murata and Yonekura (2012) and are ordered alphabetically. In the entries, the species name, [Japanese name], and (the risk categories of the menace of the naturalized plant in Hokkaido) are noted. The risk categories follow the scheme of Hokkaido (2010).

The naturalized age in the southern Kurils (Shikotan, Kunashir and Iturup) was estimated from the records of Miyabe (1860), Tatewaki (1957), and Barkalov (2009) and our data. The introduced age is classified into the following periods; 1) the Ainu period, in which naturalized plants were first recorded in Miyabe (1860), 2) the Japanese period, in which the plants in question were first recorded in Tatewaki (1957), 3) the Russian period, in which the plants were first recorded in Barkalov (2012), and 4) the Newest period, in which the plants in question were first recorded in the present study, including our recent records (Fukuda et al. 2013). The floristic similarity of the alien plants was clarified in comparison with plants in the neighboring territories: Hokkaido (Igarashi 2001) and Sakhalin (Smirnov 2002). The localities for each species were arranged from southwest to northeast. The specimens and photographs listed are deposited in SAPS (Herbarium, the Hokkaido University Museum, Sapporo). Annotations have been added for some species. Terms follow Pyšek et al. (2004).

Results and Discussion

1. List of alien plants of the three islands

Alien species, collected or confirmed by photographs in field research 2009-2012 from Shikotan, Kunashir and Iturup are described. During the research, the following 21 alien plants were first found in the southern Kurils: *Aegopodium podagraria* L., *Daucus carota* L. subsp. *carota*, a double-flowered form of *Achillea ptarmica* L., *Rudbeckia laciniata* L. var. *hortensis* L.H.Bailey, *Solidago gigantea* Aiton subsp. *serotina* (Kuntze) McNeill, *Tanacetum vulgare* L. var. *vulgare*, *Echium vulgare* L., *Symphytum ×uplandicum* Nyman, *Brassica napus* L., *Cakile edentula* (Bigelow) Hook., *Saponaria officinalis* L., *Chenopodium ficifolium* Sm., *Lupinus polyphyllus* Lindl., *Melilotus officinalis* (L.) Pall. subsp. *suaveolens* (Ledeb.) H. Ohashi, *Trifolium campestre* Schreb., *Hypericum perforatum* L., *Mentha ×gracilis* Sole, *Oxalis dillenii* Jacq., *Anthoxanthum odoratum* L. subsp. *glabrescens* (Čelak.) Asch. et Graebn., *Elytrigia repens* (L.) Desv. ex B.D.Jackson var. *aristata* (Doell) Prokud. and *Lolium perenne* L.

APIACEAE

Aegopodium podagraria L. [Iwa-mitsuba] (Hokkaido: A2) Newest

period!

KUNASHIR: Yuzhno-Kuril'sk (Furukamappu). Aug. 18, 2012. T. Fukuda 2012-7.

Note: Cultivated plants were left growing in the central part of Yuzhno-Kuril'sk, Kunashir. On Hokkaido this species was introduced and planted in a garden, but after that, it escaped and is now invading forests. Due to its strong propagation by long branching rhizomes, Hokkaido (2010) regarded this species as a high-risk invasive plant on Hokkaido (A2 rank).

Daucus carota L. subsp. *carota* [Nora-ninjin] (Hokkaido: A3) Newest period!

ITURUP: Kuril'sk (Shana). Sep. 1, 2012. H. Takahashi. Photo!

Note: This species was found at the side of the main road within Kuril'sk. It was not common there.

ASTERACEAE

Achillea millefolium L. [Seiyō-nokogiri-sō] (Hokkaido: A3) Russian period.

KUNASHIR: E of Golvnino (Tomari). Aug. 21, 2012. H. Takahashi et al. 35237.

KUNASHIR: Tret'yakovo (Chibukaribetsu). Aug. 25, 2012. Y. Kato 2012-314.

KUNASHIR: Yuzhno-Kuril'sk (Furukamappu). Aug. 18, 2012. T. Fukuda 2012-36.

KUNASHIR: Cape Veslo (Keramui-misaki). Aug. 21, 2012. T. Fukuda 2012-222.

ITURUP: Kuril'sk (Shana). Aug. 26, 2012. T. Fukuda 2012-333. fls-pink.

ITURUP: Kuril'sk (Shana). Sep. 1, 2012. T. Fukuda 2012-580.

ITURUP: Airport. Aug. 17, 2011. A. Taran s.n.

ITURUP: Reydovo (Bettobi). Sep. 1, 2012. T. Fukuda 2012-611.

Achillea ptarmica L., double-flowered cultivar. [Ōbana-nokogiri-sō] (Hokkaido: B) Newest period!

KUNASHIR: Mt. Mechnikova (Rausu-yama). Aug. 24, 2012. H. Sato 01584; Y. Kato 2012-292.

ITURUP: Kuril'sk. Sep. 8, 2012. H. Takahashi & T. Fukuda 35775.

Note: A double-flowered form of this species was found in a waste area. It may have escaped or been left growing in a garden.

Arctium lappa L. [Gobō] (Hokkaido: A3) Russian period.

KUNASHIR: Yuzhno-Kuril'sk (Furukamappu): Aug. 24, 2012. H. Sato 01575.

ITURUP: Osennyaya River. Sep. 4, 2012. H. Takahashi & T. Fukuda 35633.

ITURUP: Kuril'sk (Shana). Aug. 26, 2012. T. Fukuda 2012-332.

ITURUP: Kuril'sk (Shana). Sep. 1, 2012. T. Fukuda 2012-577.

Arctium tomentosum Mill. [Watage-gobō] (Hokkaido: —) Russian period.

SHIKOTAN: Krabozavodskoye (Anama). Aug. 29, 2010. H. Takahashi. Photo!

KUNASHIR: Yuzhno-Kuril'sk (Furukamappu). Aug. 18, 2012. T. Fukuda 2012-38.

- ITURUP: Osennaya River (Oimon-gawa). Sep. 4, 2012. H. Takahashi 35633.
- ITURUP: Kuril'sk (Shana). Aug. 25, 2012. T. Fukuda 2012-317.
- Note:** This species has not been reported previously as an alien plant on Hokkaido. It may have been introduced to the southern Kurils from Sakhalin.
- Bellis perennis*** L. [Hinagiku] (Hokkaido: B) Russian period.
- ITURUP: Reydovo (Bettobu). Sep. 1, 2012. T. Fukuda 2012-600.
- Centaurea jacea*** L. [Yaguruma-azami] (Hokkaido: B) Russian period.
- ITURUP: Kuril'sk (Shana). Sep. 8, 2012. H. Takahashi. Photo!
- ITURUP: Kuril'sk (Shana). Sep. 9, 2012. T. Fukuda-701.
- Note:** This species was found in a wasteland in the suburbs of Kuril'sk. It may have once been cultivated in a garden and escaped.
- Cirsium vulgare*** (Savi) Ten. [Amerika-oni-azami] (Hokkaido: A2) Russian period.
- ITURUP: Kuril'sk (Shana). Aug. 25, 2012. T. Fukuda 2012-324.
- Erigeron annuus*** (L.) Pers. [Himejoon] (Hokkaido: A3) Russian period.
- KUNASHIR: Andreyevka River. Aug. 22, 2012. H. Takahashi et al. 35285.
- KUNASHIR: Mt. Mechnikova (Rausu-yama). Aug. 24, 2012. H. Sato 01583.
- KUNASHIR: Yuzhno-Kuril'sk (Furukamappu). Aug. 18, 2012. T. Fukuda 2012-23.
- Erigeron strigosus*** Muhl. ex Willd. [Heraba-himejoon] (Hokkaido: B) Russian period.
- SHIKOTAN: Aug. 11, 2010. A. Taran s.n.
- KUNASHIR: Around Golovnino (Tomari). Aug. 21, 2012. H. Takahashi et al. 35270.
- KUNASHIR: Yuzhno-Kuril'sk (Furukamappu). Oct. 21, 2009. H. Takahashi 34656, 34660.
- Galinoga parviflora*** Cav. [Kogome-giku] (Hokkaido: B) Russian period.
- KUNASHIR: Tret'yakovo (Chibukaribetsu). Aug. 25, 2012. Y. Kato 2012-308.
- Gnaphalium sylvaticum*** L. [Edauchi-chichiko-gusa] (Hokkaido: B) Russian period.
- SHIKOTAN: Mt. Shikotan. Aug. 23, 2010. H. Takahashi 34943.
- ITURUP: Pioneer to Osennaya River. Sep. 4, 2012. H. Takahashi & T. Fukuda 35649.
- ITURUP: Reydovo (Bettobi). Sep. 1, 2012. T. Fukuda 2021-617.
- ITURUP: Pacific side of Vetrovoy Peresheyek (Rucharu-gen'ya). Aug. 29, 2012. H. Takahashi & T. Fukuda 35546.
- Gnaphalium uliginosum*** L. [Hime-chichiko-gusa] (Hokkaido: B) Russian period.
- KUNASHIR: Lake Veslovskoye (Keramui-ko). Aug. 21, 2012. H. Takahashi et al. 35273.
- KUNASHIR: Lake Serebryanoye (Furukamappu-ko). Aug. 23, 2012. Y. Kato 2012-252.
- ITURUP: Kuibyshevka River (Rubetsu-gawa). Aug. 30, 2012. T. Fukuda 2012-540.
- ITURUP: Kuril'sk (Shana). Sep. 1, 2012. T. Fukuda 2012-588.
- ITURUP: Lake Sopochnoye (Tōro-numa). Aug. 28, 2012. T. Fukuda 2012-477; H. Takahashi & T. Fukuda 35436, 35438.
- ITURUP: Dobrynin Bay (Otoimaushi). Aug. 27, 2012. T. Fukuda 2012-373.
- Leontodon autumnalis*** L. [Akino-tanpopo-modoki] (Hokkaido: —) Russian period.
- SHIKOTAN: Aug. 18, 2010. A. Taran s.n.
- SHIKOTAN: Otradnaya Bay (Matakotan-wan). Aug. 22, 2010. H. Takahashi 34969.
- KUNASHIR: Lake Veslovskoye (Keramui-ko). Aug. 21, 2012. Y. Kato 2012-154.
- KUNASHIR: Climbing road to Lake Goryacheye (Ichibishinai-ko). Aug. 20, 2012. H. Takahashi et al. 35234.
- KUNASHIR: Cape Chetverikova. Aug. 18, 2012. H. Takahashi et al. 35018; Y. Kato 2012-009.
- KUNASHIR: Yuzuno-Kuril'sk (Furukamappu). Oct. 21, 2009. H. Takahashi 34650, 34655.
- KUNASHIR: Yuzhno-Kuril'sk (Furukamappu). Oct. 28, 2009. H. Takahashi 34719.
- KUNASHIR: Yuzhno-Kuril'sk (Furukamappu). Aug. 18, 2012. T. Fukuda 2012-18, -21.
- KUNASHIR: Lake Serebryanoye (Furukamappu-ko). Aug. 23, 2012. Y. Kato 2012-223.
- KUNASHIR: Lake Aliger (Arigeru-ko). Aug. 22, 2012. Y. Kato 2012-200.
- ITURUP: Pioneer to Kuril'sk (Rubetsu to Shana). Sep. 6, 2012. H. Takahashi & T. Fukuda 35746.
- ITURUP: Kuril'sk (Shana). Aug. 16, 2011. A. Taran s.n.
- ITURUP: Kuril'sk (Shana). Aug. 25, 2012. T. Fukuda 2012-314.
- Note:** This species is a very common naturalized plant in the Kuril Islands, but it has not been previously reported from Hokkaido except for one doubtful record in Sapporo (Igarashi 2001).
- Leucanthemum vulgare*** [Furansu-giku] (Hokkaido: A2) Russian period.
- SHIKOTAN: Aug. 11, 2010. A. Taran s.n.
- KUNASHIR: Cape Chetverikova. Aug. 18, 2012. H. Takahashi 35019.
- KUNASHIR: Lake Serebryanoye (Furukamappu-ko). Aug. 23, 2012. Y. Kato 2012-237, 2012-254.
- KUNASHIR: Yuzhno-Kuril'sk (Furukamappu). Oct. 21, 2009. H. Takahashi 34649.
- KUNASHIR: Yuzhno-Kuril'sk (Furukamappu). Aug. 18, 2012. T. Fukuda 2012-17.
- ITURUP: Kuril'sk (Shana). Aug. 4, 2011. A. Taran s.n.
- Note:** This ornamental plant has been invading the subalpine broad-leaved meadows on the coastal terrace. Similar situations are observed in mountain meadows of Hokkaido.
- Matricaria matricarioides*** (Less.) Ced. Porter ex Britton [Koshikagiku] (Hokkaido: B) Ainu period.
- SHIKOTAN: Aug. 11, 2010. A. Taran s.n.

- SHIKOTAN: Krabozavodskoye (Anama). Aug. 22, 2010. H. Takahashi 34951.
- KUNASHIR: E of Golvnino (Tomari). Aug. 21, 2012. H. Takahashi et al. 35236.
- KUNASHIR: Yuzhno-Kuril'sk (Furukamappu). Oct. 21, 2009. H. Takahashi 34653.
- KUNASHIR: Tret'yakovo (Chibukaribetsu). Aug. 25, 2012. Y. Kato 2012-307.
- KUNASHIR: Yuzhno-Kuril'sk (Furukamappu). Aug. 18, 2012. T. Fukuda 2012-6.
- KUNASHIR: Around Golvnino (Tomari). Aug. 21, 2012. T. Fukuda 2012-223.
- ITURUP: Dobryina Bay (Otoimaushi). Aug. 27, 2012. H. Takahashi & T. Fukuda 35379.
- Note:** Miyabe (1890) recorded this species from Urup as “ex Max.” which refers the information from Dr. Maximowicz, recorded as *Matricaria discoidea* DC. in his flora. Thus *M. matricarioides* is an old naturalized plant that may have been introduced to the Kurils by Russians.
- Pilosella aurantiaca* (L.) F.Schultz et Sch.Bip.** [Kōrin-tanpopo] (Hokkaido: A2) Russian period.
- KUNASHIR: Tret'yakovo (Chibukaribetsu). Aug. 25, 2012. Y. Kato 2012-306.
- ITURUP: Pioneer (Rubetsu) to Kuril'sk (Shana). Sep. 6, 2012. H. Takahashi & T. Fukuda 35742.
- ITURUP: Airport. Aug. 17, 2011. A. Taran s.n.
- Note:** In Sakhalin, this species commonly invades mountain meadows.
- Rudbeckia hirta*** [Arage-hangon-sō] (Hokkaido: B) Russian period.
- KUNASHIR: Around Golvnino (Tomari). Aug. 21, 2012. H. Takahashi et al. 35269.
- Note:** A population found in Kunashir is considered a horticultural race of this species, and is similar to “Gloriosa Daisy” (Kunashir, Mt. Mechnikova. Aug. 24, 2012. Y. Kato 2012-293).
- Rudbeckia laciniata* L.** [Ō-hangon-sō] (Hokkaido: A2) Russian period.
- KUNASHIR: Saratovskaya River (Seoi-gawa) to Tyatina River (Onnebetsu-gawa). Oct. 22, 2009. H. Takahashi 34698.
- KUNASHIR: Mouth of Tyatina River. Oct. 24, 2009. J. Ozasa s.n.
- Note:** This species forms thick, dense colonies around the mouth of the Tyatina River (Onnebetsu-gawa) at the southwest foot of Mt. Tyatya. For conservation of the natural meadow vegetation, the plants should be removed.
- Rudbeckia laciniata* L. var. *hortensis* L.H.Bailey** [Hanagasa-giku] (Hokkaido: A2, included in *R. laciniata*). Newest period!
- KUNASHIR: Tret'yakovo (Chibukaribetsu). Aug. 25, 2012. Y. Kato 2012-305.
- Note:** Igarashi (2001) listed this variety as a naturalized plant on Hokkaido. This variety is planted in gardens, and has escaped often on Hokkaido.
- Senecio vulgaris*** [Noboro-giku] (Hokkaido: A3) Japanese period.
- SHIKOTAN: Aug. 6, 2010. A. Taran s.n.
- ITURUP: Dobryina Bay (Otoimaushi). Aug. 27, 2012. H. Takahashi & T. Fukuda 35366.
- ITURUP: Kuril'sk (Shana). Aug. 25, 2012. T. Fukuda 2012-320.
- Solidago gigantea* Aiton subsp. *serotina* (Kuntze) McNeill** [Ō-awadachi-sō] (Hokkaido: A2) Newest period!
- ITURUP: Kuril'sk (Shana). Sep. 6, 2012. H. Takahashi & T. Fukuda 35771.
- ITURUP: Kuril'sk (Shana), roadside by vacant field. Aug. 26, 2012. T. Fukuda 2012-344.
- ITURUP: Kuril'sk (Shana), grassland. Sep. 6, 2012. T. Fukuda-696.
- Note:** This species is designated as an A2 naturalized plant on Hokkaido, and removing work has been carried out in several places. However, this plant has not been previously reported from the Kuril Islands (Barkalov 2009), so this is a new record for the Kurils. It forms thick, dense colonies in the suburbs of Kuril'sk, so it should be removed as for *Rudbeckia laciniata*.
- Tanacetum vulgare* L. var. *vulgare*** [Yomogi-giku] (Hokkaido: B) Newest period!
- ITURUP: Reydovo (Bettobi). Sep. 1, 2012. H. Takahashi. Photo!
- ITURUP: Reydovo (Bettobi). Sep. 1, 2012. T. Fukuda-619.
- Note:** This variety was growing in a wasteland within the village of Reydovo.
- Taraxacum officinale*** [Seiyō-tanpopo] (Hokkaido: A2) Japanese period ?
- KUNASHIR: Saratovskaya River (Seoi-gawa). Oct. 23, 2009. H. Takahashi 34707.
- ITURUP: Sof'a Bay (Sokiya). Aug. 26, 2012. H. Takahashi & T. Fukuda 35362.
- Note:** Tatewaki reported 10 species of *Taraxacum*, including invasive *T. laviegatum* DC. in the Kuril Islands. Hence, *Taraxacum officinale* may also have invaded in the Japanese period.
- ## BALSAMINACEAE
- Impatiens glandulifera* Royle** [Oni-tsurihunesō] (Hokkaido: A3) Russian period.
- SHIKOTAN: Krabozavodskoye (Anama). Aug. 26, 2010. H. Takahashi. Photo!
- KUNASHIR: Yuzhno-Kuril'sk (Furukamappu). Aug. 24, 2012. H. Sato 01573.
- Note:** At present, it is a common naturalized plant in Sakhalin.
- ## BORAGINACEAE
- Echium vulgare* L.** [Shibenaga-murasaki] (Hokkaido: B) Newest period!
- KUNASHIR: Yuzhno-Kuril'sk (Furukamappu). Aug. 24, 2012. H. Sato 01574.
- Note:** This species is a comparatively rare alien plant on Hokkaido, and it may have recently escaped from a garden in the town of Yuzhno-Kuril'sk.
- Symphytum* × *uplandicum* Nyman** [Comfrey] (Hokkaido: A3) Newest period!

KUNASHIR: Yuzhno-Kuril'sk, in grassland by house. Aug. 23, 2012. T. Fukuda 2012-307.
ITURUP: Kuril'sk (Shana), in shrub among houses. Aug. 26, 2012. T. Fukuda 2012-334.

BRASSICACEAE

Brassica napus L. [Seiyo-aburana] (Hokkaido: B) Newest period!
ITURUP: Reydovo (Bettobu), grassland among houses. Sep. 1, 2012. T. Fukuda 2012-607.
ITURUP: Reydovo (Bettobu), dried vacant field. Sep. 1, 2012. T. Fukuda 2012-618.

Cakile edentula (Bigelow) Hook. [Onihama-daikon] (Hokkaido: A3) Newest period!

SHIKOTAN: Tserkovnaya Bay (Matsuga-hama). Aug. 25, 2010. H. Takahashi. Photo!
KUNASHIR: Cape Veslo (Keramui-misaki). Aug. 21, 2012. T. Fukuda 2012-241; H. Takahashi et al. 35276, Y. Kato 2012-138.
KUNASHIR: Lake Veslovskoye (Keramui-ko). Aug. 21, 2012. T. Fukuda 2012-237; H. Takahashi et al. 35239, 35244.
KUNASHIR: Lake Peschanoye (Tōfutsu-ko). Aug. 19, 2012. H. Takahashi et al. 35142; Y. Kato 2012-107.
KUNASHIR: Between 13km village and Stolbchatyy Cape (Zaimoku-iwa). Aug. 22, 2012. H. Takahashi et al. 35316.
ITURUP: Kuril'sk (Shana). Sep. 1, 2012. T. Fukuda 2012-582.
ITURUP: Senokosnaya (Shimonaibo-gyojo). Aug. 27, 2012. T. Fukuda 2012-413.
ITURUP: Sof'a Bay (Sokiya). Aug. 26, 2012. H. Takahashi & T. Fukuda 35333.

Note: Fukuda et al. (2013) recorded a new invasion of this species from the Kunashir and Iturup Islands. The species is very rarely observed in Shikotan, but becomes somewhat common on the sandy beaches of Kunashir and Iturup.

Capsella bursa-pastoris (L.) Medik. [Nazuna] (Hokkaido: +) Ainu period.

SHIKOTAN: Aug. 11, 2010. A. Taran s.n.
KUNASHIR: Yuzhno-Kuril'sk (Furukamappu). Aug. 18, 2012. T. Fukuda 2012-10.
ITURUP: Kuril'sk (Shana). Aug. 7, 2011. A. Taran s.n.
ITURUP: Kuril'sk (Shana). Sep. 1, 2012. T. Fukuda 2012-586.
Note: It is regarded as a prehistorically introduced plants in Japan (Shimizu 2003), and by the end of the 1800s, it was already common around the settlements and roadsides of Iturup (Miyabe 1890).

Raphanus raphanistrum L. [Seiyō-no-daikon] (Hokkaido: B) Russian period.

ITURUP: Kuril'sk (Shana). Sep. 1, 2012. H. Takahashi. Photo!
ITURUP: Middle of island, Okhotsk sea side, Kuril'sk. Sep. 1, 2012. T. Fukuda 2012-591.

CARYOPHYLLACEAE

Cerastium holosteoides [Ō-miminagusa] (Hokkaido: +) Ainu period.

ITURUP: Airport. Aug. 17, 2011. A. Taran s.n.

Note: This species is regarded as a prehistorically introduced plant in Japan (as *C. holosteoides* var. *hallaisanense* in Shimidzu 2003). Miyabe (1890) recorded it as *C. vulgatum* L. var. *glandulosum* Koch. from Iturup, so it may be an old plant naturalized to the Kurils. Barkalov (2009) also regarded it as a plant naturalized to the Kurils.

Sagina procumbens L. [Araitō-tsumekusa] (Hokkaido: B) Russian period.

ITURUP: Tornaya Bay (Tōro). Aug. 28, 2013. H. Takahashi & T. Fukuda 35533.

Saponaria officinalis L. [Sabon-sō] (Hokkaido: B) Newest period!
ITURUP: Kuril'sk (Shana). Sep. 1, 2012. H. Takahashi. Photo!
ITURUP: Kuril'sk, roadside by vacant field. Aug. 26, 2012. T. Fukuda 2012-345-b.

Note: This species was found in a wasteland in the suburbs of Kuril'sk. It may have recently escaped from cultivation in a garden. This species was not recorded in the Kurils (Barkalov 2009), but was recorded in Sakhalin (Barkalov and Taran 2004).

Silene vulgaris (Moench) Garcke [Shiratama-sō] (Hokkaido: B) Russian period.

ITURUP: Reydovo, dried vacant field near grassland. Sep. 1, 2012. T. Fukuda 2012-621.

Spergula arvensis var. *sativa* (Boenn.) Mert. et W.D.J.Koch [Ō-tsumekusa] (Hokkaido: A3) Japanese period.

KUNASHIR: Lake Veslovskoye (Keramui-ko). Aug. 21, 2012. H. Takahashi et al. 35272.
KUNASHIR: Andreyevka River. Aug. 22, 2012. H. Takahashi et al. 35288.

KUNASHIR: Lake Serebryanoye (Furukamappu-ko). Aug. 23, 2012. Y. Kato 2012-271.

KUNASHIR: Yuzhno-Kuril'sk (Furukamappu). Aug. 18, 2012. T. Fukuda 2012-24.

ITURUP: Lake Lebedinoye (Shana-numa). Sep. 6, 2012. H. Takahashi & T. Fukuda 35766.

ITURUP: Kuril'sk (Shana). Sep. 1, 2012. T. Fukuda-583.

Note: Plants having white papillose seeds are recognized as var. *arvensis*, which is popular in Hokkaido; on the other hand, plants having the seeds without small white papillae are described as var. *sativa*, which is popular on Sakhalin. Thus, *S. arvensis* var. *sativa* of the southern Kurils shows more similarity to Sakhalin than to Hokkaido in the variety rank.

Spergularia rubra [Usubeni-tsumekusa] (Hokkaido: B) Russian period.

ITURUP: Kasatka Bay (Hitokappu-wan). Sep. 2, 2012. H. Takahashi & T. Fukuda 35602.

Stellaria graminea L. [Karafuto-hosoba-hakobe] (Hokkaido: A3) Russian period.

KUNASHIR: Lake Veslovskoye (Keramui-ko). Aug. 21, 2012. Y. Kato 2012-144.

ITURUP: Near airport. Aug. 16, 2011. A. Taran s.n.

Stellaria media [Ko-hakobe] (Hokkaido: A3) Ainu period.

ITURUP: Reydovo (Bettobu). Aug. 7, 2011. A. Taran s.n.

Note: This species is regarded as a prehistorically introduced

plant to Japan (Shimizu 2003), and at the end of the 1800s, it was very common at Kuril'sk and elsewhere in Iturup (Miyabe 1890). Barkalov (2009) regarded it as a species naturalized to the Kuril Islands.

CHENOPODIACEAE

Chenopodium album L. [Shiroza] (Hokkaido: B) Ainu period.

ITURUP: Chernye Skaly (Biyonotsu-gyojyo). Aug. 29, 2012. H. Takahashi & T. Fukuda 35560.

Note: This species is regarded as native in Japan (Shimizu 2009), but Igarashi (2001) regarded it as naturalized to Hokkaido. Barkalov (2009) regarded it as naturalized to the Kurils, and Miyabe (1890) had already recorded it from Shikotan and Iturup. Thus, it may be a prehistorically naturalized plant in the Kurils.

Chenopodium ficifolium Sm. [Ko-akaza] (Hokkaido: B) Newest period!

ITURUP: Dobrynin Bay, coastal area. Aug. 27, 2012. T. Fukuda 2012-403.

CONVOLVULACEAE

Convolvulus arvensis L. [Seiyō-hirugao] (Hokkaido: A3) Russian period.

ITURUP: Kuril'sk (Shana). Sep. 1, 2012. H. Takahashi. Photo!

ITURUP: Kuril'sk (Shana). Sep. 1, 2012. T. Fukuda-576.

FABACEAE

Lupinus polyphyllus Lindl. [Shukkon-lupinus] (Hokkaido: A3) Newest period!

ITURUP: Kuril'sk (Shana). Sep. 1, 2012. H. Takahashi. Photo!

Melilotus officinalis (L.) Pall. subsp. *suaveolens* (Ledeb.) H. Ohashi [Shinagawa-hagi] (Hokkaido: A3) Newest period!

ITURUP: Kuril'sk (Shana). Aug. 25, 2012. T. Fukuda 2012-308.

Note: This species was growing sporadically in wastelands within the town of Kuril'sk.

Trifolium campestre Schreb. [Kusudama-tsumekusa] Newest period!

ITURUP: Kuril'sk (Shana). Sep. 1, 2012. T. Fukuda 2012-589.

Trifolium hybridum L. [Tachi-oranda-geenge] (Hokkaido: A3) Russian period.

ITURUP: Kuril'sk (Shana). Sep. 1, 2012. T. Fukuda 2012-593.

Trifolium pratense L. [Murasaki-tsumekusa] (Hokkaido: A2) Japanese period.

KUNASHIR: Cape Chetverikova. Aug. 18, 2012. H. Takahashi 35009.

KUNASHIR: Yuzhno-Kuril'sk (Furukamappu). Oct. 21, 2009. H. Takahashi 34652.

KUNASHIR: Yuzhno-Kuril'sk (Furukamappu). Aug. 18, 2012. T. Fukuda 2012-27.

KUNASHIR: Cape Remontnyy (Kinakai-zaki). Oct. 21, 2009. H. Takahashi 34684. White fls!

ITURUP: Lake Kuibyshevskoye (Rausu-numa). Aug. 30, 2012. T. Fukuda 2012-566a.

ITURUP: Kuril'sk (Shana). Aug. 26, 2012. T. Fukuda 2012-343.

ITURUP: Dobrynina Bay (Otoimaushi). Aug. 27, 2012. H. Takahashi & T. Fukuda 35395.

Note: Miyabe (1890) did not record *T. pratense* from the southern Kurils. Afterward, Tatewaki (1957) recorded it on several islands of the Kurils. This species is now a very common plant naturalized to the Kurils.

Trifolium repens L. [Shiro-tsumekusa] (Hokkaido: A2) Japanese period.

KUNASHIR: Cape Chetverikova. Aug. 18, 2012. H. Takahashi 35012.

KUNASHIR: Yuzhno-Kuril'sk (Furukamappu). Oct. 21, 2009. H. Takahashi 34648.

ITURUP: Lake Kuibyshevskoye (Rausu-numa). Aug. 30, 2012. T. Fukuda 2012-566b.

ITURUP: Tornaya Bay (Tōro) to Senokosnaya Bay (Shimonaibo-gyojyo). Aug. 28, 2012. H. Takahashi & T. Fukuda 35467.

ITURUP: Dobrynina Bay (Otoimaushi). Aug. 27, 2012. H. Takahashi & T. Fukuda 35394.

Note: The history of this plant's introduction to the Kurils may be the same as that of *T. pratense*.

GERANIACEAE

Geranium sibiricum L. [Ichige-fūro] (Hokkaido: +) Japanese period?

ITURUP: Kuril'sk (Shana). Aug. 7, 2011. A. Taran s.n.

Note: This species is recognized as a native plant of Japan (Shimizu 2003) and of Hokkaido (Igarashi 2001), but Barkalov (2009) regarded it as a plant alien to the Kurils. Miyabe (1890) did not record it, but Tatewaki (1957) did from the Kurils. Therefore, in the early 1900s, this species must have been introduced to the Kurils.

HYPERICACEAE

Hypericum perforatum L. [Seiyō-otogiri] (Hokkaido: B) Newest period!

SHIKOTAN: Krabozavodskoye (Anama). Aug. 29, 2010. H. Takahashi. Photo!

ITURUP: Near airport Burevestnik (Tennei). Aug. 17, 2011. A. Taran s.n.

JUNCACEAE

Juncus bufonius L. [Hime-kōgai-zekishō] (Hokkaido: —) Japanese period?

KUNASHIR: Lake Veslovskoye (Keramui-ko). Aug. 21, 2012. H. Takahashi et al. 35274.

ITURUP: E of Kasatka Bay (Hitokappu-wan). Sep. 2, 2012. H. Takahashi & T. Fukuda 35609.

ITURUP: Dobrynin Bay (Otoimaushi). Aug. 27, 2012. T. Fukuda 2012-372; H. Takahashi & T. Fukuda 35386.

Note: This species is recognized as a native plant of Japan (Shimizu 2003) as it is of Hokkaido (Igarashi 2001), but Barkalov (2009) regarded it as a naturalized plant of the Kurils.

Because Miyabe (1890) did not record it but Tatewaki (1957) did from the Kurils, this species must have introduced to the Kurils in the early 1900s.

Juncus tenuis Willd. [Kusa-i] (Hokkaido: –) Japanese period?

KUNASHIR: Cape Chetverikova, Aug. 18, 2012. H. Takahashi et al. 35000, Y. Kato 2012-003.

KUNASHIR: Andreyevka River. Aug. 22, 2012. H. Takahashi et al. 35284.

KUNASHIR: Coastal grassland near Andreyevka. Aug. 18, 2012. T. Fukuda 2012-40.

KUNASHIR: Lake Peschanoye (Tōfutsu-ko). Aug. 19, 2012. Y. Kato 2012-102.

ITURUP: Tornaya Bay (Tōro). Aug. 28, 2012. H. Takahashi & T. Fukuda 35537.

Note: This species is generally not regarded as a naturalized plant of Hokkaido (Hokkaido 2010), or is a prehistorically introduced plant in Japan (Shimizu 2003). On the other hand, Barkalov (2009) regarded it as naturalized to the Kuril Islands. Based to the absence of this species in Miyabe (1890) and its presence in Tatewaki (1957) on the Kurils, it should have been introduced to the southern Kurils in the early 1900s.

LAMINACEAE

Elsholtzia ciliata (Thunb.) Hylander [Naginata-Kōju] (Hokkaido: +) Japanese period?

ITURUP: Kuril'sk (Shana), by farm field. Sep. 1, 2012. T. Fukuda 2012-597.

Note: In Japan including Hokkaido, this plant is regarded as a native species, but Barkalov (2009) treated it as a naturalized species in the Kurils.

Galeopsis bifida Boenn. [Chishima-odorikosō] (Hokkaido: A3) Japanese period?

SHIKOTAN: Aug. 10, 2010. A. Taran s.n.

KUNASHIR: Yuzhno-Kuril'sk (Furukamappu). Aug. 18, 2012. T. Fukuda 2012-11.

ITURUP: NE of Lake Maloye (Rubetsu-numa). Aug. 30, 2012. H. Takahashi & T. Fukuda 35592.

ITURUP: Sof'a Bay (Sokiya). Aug. 26, 2012. H. Takahashi & T. Fukuda 35346.

ITURUP: Along Kuibyshevka River (Rubetsu-gawa). Aug. 30, 2012. T. Fukuda 2012-539.

Mentha ×gracilis Sole [America-hakka] (Hokkaido: B) Newest period!

ITURUP: Kuril'sk (Shana). Sep. 1, 2012. T. Fukuda 2012-594.

Note: In *Mentha ×gracilis* leaves at the base of every successive verticillaster become smaller.

ONAGRACEAE

Oenothera biennis L. [Me-matsuyoi-gusa] (Hokkaido: A3) Japanese period.

KUNASHIR: Yuzhno-Kuril'sk (Furukamappu). Aug. 18, 2012. T. Fukuda 2012-29.

KUNASHIR: Lake Aliger. Aug. 22, 2012. H. Takahashi et al.

35323.

ITURUP: Kuril'sk (Shana), roadside. Aug. 26, 2012. T. Fukuda 2012-340, 342.

Note 1: According to the absence in Miyabe (1890) and presence in Tatewaki (1957) on the Kurils, this species must have been introduced to the southern Kurils in the beginning of the 1900s.

Note 2: In Kuril'sk, Iturup, we found flowers with yellow petals, as well as flowers with cream colored petals (Fukuda 2012-340, 342).

OROBANCHACEAE

Rhinanthus angustifolius C.C.Gmel. subsp. *grandiflorus* (Wallr.) D.A. Webb [Okuezo-garagara] (Hokkaido: –) Russian period.

KUNASHIR: Lake Veslovskoye (Keramui-ko). Aug. 21, 2012. H. Takahashi et al. 35275; Y. Kato 2012-148.

KUNASHIR: Cape Chetverikova to mouth of Andreyevka River. Aug. 18, 2012. H. Takahashi 35025; Y. Kato 2012-028.

KUNASHIR: Yuzhno-Kuril'sk (Furukamappu), in grassland. Aug. 18, 2012. T. Fukuda 2012-28.

KUNASHIR: Lake Serebryanoye (Furukamappu-numa). Aug. 23, 2012. Y. Kato 2012-232, 2012-244.

ITURUP: Pioneer to Osennyaya River. Sep. 4, 2012. H. Takahashi & T. Fukuda 35653.

ITURUP: Osennyaya River. Sep. 4, 2012. H. Takahashi & T. Fukuda 35620.

ITURUP: Lake Kuibyshevskoye (Rausu-numa). Aug. 30, 2012. T. Fukuda 2012-566c.

ITURUP: Pacific side of Vetrovoy Peresheyek (Rucharu-gen'ya). Aug. 29, 2012. H. Takahashi & T. Fukuda 35550, 35557.

ITURUP: Tornaya Bay (Tōro) to Senokosnaya Bay (Shimonaibo-gyojyo). Aug. 28, 2012. H. Takahashi & T. Fukuda 35505.

ITURUP: Sopochnoye (Tōro). Aug. 28, 2012. T. Fukuda 2012-450.

ITURUP: Middle of island, Okhotsk sea side, Reydovo, near woods in the village. Sep. 1, 2012. T. Fukuda 2012-614.

Note: This species is now a common naturalized plant of the southern Kurils and Sakhalin, but has not previously been recorded from Japan including Hokkaido (Igarashi 2001, Shimizu 2003). Due to the absence of this species from the Kurils in Miyabe (1890) and Tatewaki (1957), this species is likely a new alien from Sakhalin to the southern Kurils after the end of World War II (1945).

OXALIDACEAE

Oxalis dillenii Jacq. [Ottachi-katabami] (Hokkaido: B) Newest period!

SHIKOTAN: Aug. 10, 2010. A. Taran s. n.

ITURUP: Sept. 1, 2012. T. Fukuda 2012-584.

PLANTAGINACEAE

Plantago lanceolata L. [Hera-ōbako] (Hokkaido: A2) Russian period.

- ITURUP: Reydovo (Bettobi). Aug. 7, 2011. A. Taran s.n.
 ITURUP: Reydovo (Bettobi). Sep. 1, 2012. T. Fukuda 2012-608.
- Plantago major*** L. [Seiyō-ōbako] (Hokkaido: B) Ainu period.
 KUNASHIR: Yuzhno-Kuril'sk (Furukamappu). Aug. 18, 2012. T. Fukuda 2012-34.
- Veronica chamaedrys*** L. [Karafuto-hiyokusō] (Hokkaido: B) Russian period.
 KUNASHIR: Mouth of Tyatina River. Oct. 25, 2009. J. Ozasa s.n.
Note: Because of the absence in Miyabe (1860) and Tatewaki (1957) and the presence in Barkalov (2009) in the Kurils, it may be a new alien of the Kurils after the end of the World War II (1945).
- POACEAE**
- Agrostis gigantea*** [Konuka-gusa] (Hokkaido: A3) Russian period.
 KUNASHIR: Lake Voslovskoye (Keramui-ko). Aug. 21, 2012. H. Takahashi et al. 35271.
 KUNASHIR: Cape Chetverikova. Aug. 18, 2012. H. Sato et al. 01531 (SAPS042141), 01532 (SAPS042142).
 KUNASHIR: Mouth of Andreyevka River. Aug. 18, 2012. H. Sato 01505, 01506, 01507.
 KUNASHIR: Lake Peschanoye (Tōfutsu-ko). Aug. 18, 2012. H. Sato 01598.
 KUNASHIR: Lake Peschanoye (Tōfutsu-ko). Aug. 19, 2012. H. Sato 01718, 01719.
 KUNASHIR: Lake Aliger. Aug. 22, 2012. H. Sato 01709, 01710.
 KUNASHIR: Yuzhno-Kuril'sk (Furukamappu). Oct. 21, 2009. H. Takahashi 34658.
 KUNASHIR: Yuzhno-Kuril'sk (Furukamappu). Aug. 23, 2012. H. Sato 01652, 01668, 01669, 01670.
 KUNASHIR: Yuzhno-Kuril'sk (Furukamappu). Aug. 18, 2012. T. Fukuda 2012-16.
 ITURUP: Lake Sopochnoye (Tōro-numa). Aug. 28, 2012. H. Takahashi & T. Fukuda 35425, 35458.
 ITURUP: Dobrynina Bay (Otoimaushi). Aug. 27, 2012. H. Takahashi & T. Fukuda 35391.
 ITURUP: Middle of island, Okhotsk sea side, Kuril'sk. Sep. 1, 2012. T. Fukuda 2012-592.
 ITURUP: NW side of Lake Sopochnoye (Tōro-numa). Aug. 28, 2012. T. Fukuda 2012-517.
Note: It is a very common naturalized plant of the southern Kurils.
- Anthoxanthum odoratum*** L. subsp. *glabrescens* (Čelak.) Asch. et Graebn. [Kenashi-harugaya] (Hokkaido: A3) Newest period!
 KUNASHIR: Andreevka kordon (Urarokushibetsu). Aug. 18, 2012. H. Sato 01524 (SAPS042161); T. Fukuda 2012-62.
 KUNASHIR: Yuzhno-Kuril'sk (Furukamappu). Aug. 24, 2012. H. Sato 01580 (SAPS042215).
 ITURUP: Reydovo (Bettobu). Aug. 7, 2011. A. Taran s. n. ; Sep. 1, 2012. T. Fukuda 2012-603b.
Note: This is a new record for the subspecies on the Kuril Islands.
- Anthoxanthum odoratum*** L. subsp. *odoratum* [Haru-gaya] (Hokkaido: A3) Russian period.
 KUNASHIR: Mouth of Andreyevka River (Urarokushibetsu). Aug. 18, 2012. Y. Kato 2012-031.
 KUNASHIR: Mt. Mechnikova (Rausu-yama). Aug. 24, 2012. H. Sato 01581.
- Avena fatua*** L. [Karasu-mugi] (Hokkaido: B) Japanese period?
 KUNASHIR: Andreevka kordon (Urarokushibetsu). Aug. 18, 2012. H. Sato et al. 01601, 01833 (SAPS042236, 042513).
Note: It is regarded as a prehistorically introduced plant in Japan (Shimizu 2003).
- Bromus inermis*** Leyss. [Ko-suzumeno-chahiki] (Hokkaido: A3) Russian period.
 KUNASHIR: Yuzhno-Kuril'sk (Furukamappu). Aug. 24, 2012. H. Sato 01646 — 01648 (SAPS042406-042408).
 ITURUP: Kuril'sk (Syana). Aug. 25, 2012. T. Fukuda 2012-311.
- Dactylis glomerata*** L. (Kamo-gaya) (Hokkaido: A3) Japanese period.
 KUNASHIR: Cape Chetverikova (Seikarahoru-zaki). Aug. 18, 2012. H. Sato et al. 01531, 01532, 01534, 01535.
 KUNASHIR: Andreevka River (Urarokushibetsu-gawa). Aug. 18, 2012. T. Fukuda 2012-51.
 KUNASHIR: Yuzhno-Kuril'sk (Furukamappu). Aug. 24, 2012. H. Sato 01672, 01673 (SAPS042432, 042433).
 ITURUP: Kuril'sk (Shana). Aug. 26, 2012. T. Fukuda 2012-331.
 ITURUP: Reydovo (Bettobu). Sep. 1, 2012. T. Fukuda 2012-596.
- Elytrigia repens*** (L.) Desv. ex B.D.Jackson var. *aristata* (Doell) Prokud. [Noge-shiba-mugi] (Hokkaido: A3) Newest period!
 KUNASHIR: Lake Serebryanoye (Furukamappu-shitsugen). Aug. 23, 2012. H. Sato & Y. Kato 01605-01608 (SAPS042240-042243).
 ITURUP: Reydovo (Bettobu). Sep. 1, 2012. T. Fukuda 2012-603a.
Note: *Elytrigia repens* var. *aristata* is distinguished from *E. repens* var. *repens* in having the long awns. This infraspecific taxon may be included in *E. repens* by Russian botanists, but this variety name has not been reported before in the southern Kurils, so we regarded it as a new alien.
- Elytrigia repens*** (L.) Desv. ex B.D.Jackson var. *repens* [Shiba-mugi] (Hokkaido: A3) Russian period.
 KUNASHIR: Yuzhno-Kuril'sk (Furukamappu). Aug. 23, 2012. H. Sato 01605, 01606, 01607, 01608 (SAPS042240-042243).
 ITURUP: Kuril'sk (Shana). Aug. 4, 2011. A. Taran s.n.
 ITURUP: Kuril'sk (Syana). Aug. 26, 2012. T. Fukuda 2012-341.
 ITURUP: Kuril'sk (Syana). Sep. 1, 2012. T. Fukuda 2012-595.
Note 1: Because of the absence in Miyabe (1860) and Tatewaki (1957), it may be a new alien of the southern Kurils from after the end of World War II (1945).
Note 2: This plant is treated as “*Elytrigia repens* (L.) Nevski” in the literature of Russian botanists.
- Festuca pratensis*** [Hirohano-ushinokegusa] (Hokkaido: A3) Russian period.
 KUNASHIR: Cape Chetverikova to mouth of Andreyevka River.

- Aug. 18, 2012. H. Sato 01503, 01504.
KUNASHIR: Yuzhno-Kuril'sk (Furukamappu). Aug. 24, 2012. H. Sato 01578.
- Holcus lanatus*** L. [Shirage-gaya] (Hokkaido: B) Russian period.
KUNASHIR: Yuzhno-Kuril'sk (Furukamappu). Aug. 24, 2012. H. Sato 01576, 01577 (SAPS042211, 042212).
- Lolium perenne*** L. [Hoso-mugi] (Hokkaido: A3) Newest period!
ITURUP: Kuril'sk (Syana). Sep. 1, 2012. T. Fukuda 2012-574.
Note: Barkalov (2009) reported this species from Paramushir of the northern Kurils, but not from the southern Kurils.
- Phalaris arundinacea*** [Kusa-yoshi] (Hokkaido: A3) - Native plant.
ITURUP: Lake Sopochnoye (Tōro-numa). Aug. 28, 2012. H. Takahashi & T. Fukuda 35457.
ITURUP: Sof'a (Sokiya). Aug. 26, 2012. H. Takahashi & T. Fukuda 35356.
ITURUP: Dobrynin Bay (Otoimaushi-wan). Aug. 27, 2012. T. Fukuda 2012-358.
Note: It is regarded as one of the native plants of Japan (Shimizu 2003) and of the Kurils (Barkalov 2009), but Igarashi (2001) regarded it as a naturalized plant of Hokkaido. As it is found in native habitats in the Kurils, we regard it as native to the Kurils.
- Phleum pratense*** L. [Ō-awagaeri] (Hokkaido: A3) Japanese period.
KUNASHIR: Lake Veslovskoye (Keramui-ko). Aug. 21, 2012. H. Takahashi et al. 35245; H. Sato 01548.
KUNASHIR: Around Golvnino (Tomari). Aug. 21, 2012. H. Takahashi et al. 35268.
KUNASHIR: Cape Chetverikova. Aug. 18, 2012. H. Takahashi et al. 35004; Y. Kato 2012-011.
KUNASHIR: Cape Chetverikova to mouth of Andreyevka River. Aug. 18, 2012. H. Sato 01530.
KUNASHIR: Mouth of Andreyevka River. Aug. 18, 2012. H. Sato 01612.
KUNASHIR: Lake Peschanoye (Tōfutsu-ko). Aug. 18, 2012. H. Sato 01590.
KUNASHIR: Lake Peschanoye (Tōfutsu-ko). Aug. 19, 2012. H. Sato 01622.
KUNASHIR: Yuzhno-Kuril'sk (Furukamappu). Oct. 21, 2009. H. Takahashi 34657.
KUNASHIR: Yuzhno-Kuril'sk (Furukamappu). Aug. 18, 2012. T. Fukuda 2012-4, 14.
KUNASHIR: Saratovskaya River (Seoi-gawa) to Tyatina River (Onnebetsu-gawa). Oct. 22, 2009. H. Takahashi 34697.
ITURUP: Pacific side of Vetrovoy Peresheyek (Rucharu-gen'ya). Aug. 29, 2012. H. Takahashi & T. Fukuda 35548.
ITURUP: Osennyya River (Oito-gawa). Sep. 4, 2012. H. Takahashi & T. Fukuda 35629.
ITURUP: Lake Sopochnoye (Tōro-numa). Aug. 28, 2012. H. Takahashi & T. Fukuda 35464.
ITURUP: Sof'a Bay (Sokiya). Aug. 26, 2012. H. Takahashi & T. Fukuda 35352.
ITURUP: Reydovo (Bettobu), grassland among houses. Sep. 1, 2012. T. Fukuda 2012-612.
- Note:** It is a very common naturalized plants of the southern Kurils.
- Poa annua*** L. [Suzumeno-katabira] (Hokkaido: +) Ainu period.
KUNASHIR: Cape Chetverikova to mouth of Andreyevka River. Aug. 18, 2012. H. Sato 01530.
KUNASHIR: Yuzhno-Kuril'sk (Furukamappu). Aug. 18, 2012. T. Fukuda 2012-13.
KUNASHIR: Cape Chetverikova (Seikarahoru-zaki). Aug. 18, 2012. H. Sato et al. 01521 (SAPS042156).
KUNASHIR: Golvnino (Tomari). Aug. 21, 2012. H. Takahashi et al. 35238.
KUNASHIR: Cape Stolbchatyy (Yaitaikotan seaside, Zaimokuiwa). Aug. 21, 2012. H. Sato et al. 01702 (SAPS042462).
KUNASHIR: Lake Serebryanoye (Furukamappu-shitsugen). Aug. 23, 2012. H. Sato & Y. Kato 01604 (SAPS042239).
ITURUP: Dobrynina Bay (Otoimaushi). Aug. 27, 2012. H. Takahashi & T. Fukuda 35377.
Note: *Poa annua* s. lat. in Japan is composed of both native plants and naturalized plants introduced after the Meiji period (Shimizu 2003). Igarashi (2001) regarded it as a native species (prehistorically introduced) on Hokkaido. Barkalov (2009) regarded it as the naturalized species of the Kuril Islands, but Miyabe (1860) has already recorded it from the Kurils. This species may include both prehistorically introduced individuals and new aliens in the Kurils.
- Poa palustris*** L. [Numa-ichigotsunagi] (Hokkaido: B) - Native plant.
KUNASHIR: Yuzhno-Kuril'sk (Furukamappu). Aug. 23, 2012. H. Sato 01571.
Note: Barkalov (2009) recognized it as a native plant of the Kurils. This plant is listed as a naturalized plant of Japan (Shimizu 2003), but Shimizu (2003) pointed out the possibility of the presence of native individuals on Hokkaido. Here we regard it as a native plant of the Kurils as in the opinion of Barkalov (2009).
- Poa pratensis*** L. [Nagaha-gusa] (Hokkaido: A3) Ainu period.
KUNASHIR: Yuzhno-Kuril'sk (Furukamappu). Aug. 18, 2012. T. Fukuda 2012-25, 26.
ITURUP: Kuril'sk (Syana). Aug. 25, 2012. T. Fukuda 2012-323.
ITURUP: Kuril'sk (Syana). Aug. 26, 2012. T. Fukuda 2012-341.
ITURUP: Dobrynina Bay (Otoimaushi). Aug. 27, 2012. H. Takahashi & T. Fukuda 35367.
ITURUP: Lake Sopochnoye (Tōro-numa). Aug. 28, 2012. H. Takahashi & T. Fukuda 35424, 35449.
ITURUP: The Pacific side of Vetrovoy Peresheyek (Rucharu-gen'ya). Aug. 29, 2012. H. Takahashi & T. Fukuda 35542, 35552.
Note: Barkalov (2009) recognized it as a naturalized plant of the Kurils. Shimizu (2003) noticed the possibility of native plants of *P. pratensis* in the Japanese mountains, and Igarashi (2001) also noticed both the naturalized and native individuals on Hokkaido. Miyabe (1860) has already recorded this species, so at least some plants are native or prehistorically introduced to the Kurils.

Poa trivialis L. [Ō-suzumeno-katabira] (Hokkaido: A3) Russian period?

KUNASHIR: Cape Veslo (Kemurai-zaki). Aug. 21, 2012. H. Sato et al. 01549, 01550 (SAPS042184, 042185).

KUNASHIR: Lake Serebryanoye (Furukamappu-shitsugen). Aug. 23, 2012. H. Sato & Y. Kato 01572 (SAPS042207).

Schedonorus pratensis (Huds.) Beauv. [Hiroha-ushinoke-gusa] (Hokkaido: A3) Russian period.

KUNASHIR: Cape Chetverikova (Seikarahoru-zaki). Aug. 18, 2012. H. Sato et al. 01503, 01504 (SAPS042138, 042139).

KUNASHIR: Yuzhno-Kuril'sk (Furukamappu). Aug. 24, 2012. H. Sato 01578 (SAPS042213).

ITURUP: Reydovo (bettobu). Sep. 1, 2012. T. Fukuda 2012-604.

POLYGONACEAE

Persicaria lapathifolia (L.) Delarbre var. *incana* (Roth) H.Hara [Sanae-tade] (Hokkaido: +) Japanese period.

KUNASHIR: Lake Peschanoye. Aug. 19, 2012. H. Takahashi et al. 35118.

Persicaria maculosa Gray [Haru-tade s.l.] (Hokkaido: +) Russian period.

ITURUP: Senokesnaya Bay. Aug. 27, 2012. H. Takahashi & T. Fukuda 35422.

ITURUP: Dobrynina Bay. Aug. 27, 2012. H. Takahashi & T. Fukuda 35405.

ITURUP: Dobrynina bay (Otoimaushi-wan). Aug. 27, 2012. T. Fukuda 2012-402.

ITURUP: Sof'a Bay, Aug. 26, 2012. H. Takahashi & T. Fukuda 35347.

ITURUP: Kuril'sk (Shana). Sep. 1, 2012. T. Fukuda 2012-579.

ITURUP: NW coast of Lake Sredneye (Rebun-numa). Sep. 2, 2012. T. Fukuda 2012-641.

Note: Plants collected from Dobrynin Bay and from Sredneye, Iturup, had short inflorescence and low spreading stems, and are considered as *P. maculosa* ssp. *maculosa*. However, this plant had some hairless glands on inflorescences. As our specimens were difficult to identify at the subspecies level, we adopted *P. maculosa* s. l.

Persicaria nepalensis (Meisn.) H.Gross [Tani-soba] (Hokkaido: +) Japanese period?

SHIKOTAN: Krabozavodskoye (Anama). Aug. 29, 2010. H. Takahashi. Photo!

KUNASHIR: Andreyevka River. Aug. 22, 2012. H. Takahashi et al. 35289.

Note: This species is commonly recognized as a native plant of Japan (Shimizu 2003) and Hokkaido (Igarashi 2001). However, Barkalov (2009) regarded it as a naturalized plant of the Kuril Islands. According to our observations, this species is sometimes found in wastelands around residential area in Shikotan and Kunashir. In the present study, we regard it as a naturalized plant of the southern Kurils as in the opinion of Barkalov (2009).

Polygonum aviculare L. [Michi-yanagi] (Hokkaido: +) Ainu period.

ITURUP: Kuril'sk (Shana), by farm field. Aug. 25, 2012. T. Fukuda 2012-330.

ITURUP: Reydovo (Bettobu), grassland among houses. Sep. 1, 2012. T. Fukuda 2012-605.

Note: This plant is regarded as prehistorically naturalized species in Japan (Shimizu 2003), but Barkalov (2009) regarded it as an alien species in the Kurils.

Polygonum aviculare L. subsp. *neglectum* (Besser) Areang. [Okumichi-yanagi] (Hokkaido: +) Russian period.

SHIKOTAN: Krabozavodskoye (Anama). Aug. 22, 2010. H. Takahashi 34962.

KUNASHIR: E of Golvnino (Tomari). Aug. 21, 2012. H. Takahashi et al. 35235.

KUNASHIR: Cape Chetverikova to mouth of Andreyevka. Aug. 18, 2012. Y. Kato 2012-013.

KUNASHIR: Yuzhno-Kuril'sk (Furukamappu). Oct. 21, 2009. H. Takahashi 34654.

KUNASHIR: Tret'hakovo (Chibukaribetsu). Aug. 25, 2012. Y. Kato 2012-300, 2012-301.

ITURUP: Chernyye Skaly (Biyonotsu-gyojyo). Aug. 29, 2012. H. Takahashi & T. Fukuda 35559.

ITURUP: Dobrynina Bay (Otoimaushi) . Aug. 27, 2012. H. Takahashi & T. Fukuda 35365.

Note: *Polygonum aviculare* L. is regarded as a prehistorically introduced plant of Japan (Shimizu 2003) and Hokkaido (Igarashi 2001). Barkalov (2009) recognized it as a naturalized plant of the Kurils.

Rumex acetosella L. subsp. *pyrenaicus* (Pourr. ex Lapeyr.) Akeroyd [Hime-suiba] (Hokkaido: A3) Japanese period?

KUNASHIR: Lake Veslovskoye (Keramui-ko). Aug. 21, 2012. Y. Kato 2012-146.

KUNASHIR: Yuzhno-Kuril'sk (Furukamappu). Aug. 18, 2012. T. Fukuda 2012-2.

KUNASHIR: Lake Peschanoye (Tōfutsu-ko). Aug. 19, 2012. H. Takahashi et al. 35137, Y. Kato 2012-092.

KUNASHIR: Lake Serebryanoye (Furukamappu-ko). Aug. 23, 2012. Y. Kato 2012-216.

KUNASHIR: Saratovskaya River (Seoi-gawa). Oct. 25, 2009. H. Takahashi 34715.

ITURUP: Kasatka Bay (Hitokappu-wan). Sep. 2, 2012. H. Takahashi & T. Fukuda 35597.

ITURUP: Lake Sopochnoye (Tōro-numa). Aug. 28, 2012. H. Takahashi & T. Fukuda 35448, 35460.

ITURUP: NW side of Lake Sopochnoye (Tōro-numa). Aug. 28, 2012. T. Fukuda 2012-481.

Note: Within *R. acetosella* L., two infraspecific taxa, subsp. *acetosella* and subsp. *pyrenaicus*, are recognized (Murata and Yonekura 2012). Barkalov (2009) recognized both *Acetosella angiocarpa* (Murb.) A. Löve and *Acetosella vulgaris* (Koch) Fourr. in the Kurils, but it is difficult to compare the two taxonomic opinions.

Rumex longifolius DC. [Nodaiō] (Hokkaido: +) Japanese period.

SHIKOTAN: Krabozavodskoye (Anama). Aug. 22, 2010. H.

Takahashi 34959.

KUNASHIR: Lake Peschanoye (Tōfutsu-sitsugen). Aug. 18, 2012. Y. Kato 2012-056.

ITURUP: Pacific side of Vetrovoy Peresheyek (Rucharu-gen'ya). Aug. 29, 2012. H. Takahashi & T. Fukuda 35545.

ITURUP: Sof'a Bay (Sokiya). Aug. 26, 2012. H. Takahashi & T. Fukuda 35364.

Note: This species is not regarded as a naturalized species of Japan (Shimizu 2003) or Hokkaido (Igarashi 2001). On the other hand, Barkalov (2009) regarded it as a naturalized plant of the Kuril Islands.

Rumex obtusifolius [Ezono-gishigishi] (Hokkaido: A3) Japanese period.

KUNASHIR: Andreyevka River. Aug. 22, 2012. H. Takahashi et al. 35280.

ITURUP: Lake Sopochnoye (Tōro-numa). Aug. 28, 2012. H. Takahashi & T. Fukuda 35447.

ITURUP: Dobrynya Bay (Otoimaushi). Aug. 27, 2012. H. Takahashi & T. Fukuda 35384.

ITURUP: Sof'a Bay (Sokiya). Aug. 26, 2012. H. Takahashi et al. 35344.

ROSACEAE

Alchemilla micans Buser [Hagoromo-gusa zoku] (Hokkaido: –) Russian period.

ITURUP: Airport. Aug. 17, 2011. A. Taran s.n.

Note: More than 300 species of *Alchemilla* has been described in Europe, and this species is regarded as being introduced from Europe to the Kurils (Barkalov 2009). Usually *Alchemilla* species have not introduced to Japan except for a rare case of *A. arvensis* (Scop.) L. found in Nagasaki (Tachikake 1998). Limited records of naturalized *Alchemilla subcrenata* Buser have also been noted from Sakhalin (Smirnov 2002).

Potentilla norvegica L. [Ezono-mitsumotosō] (Hokkaido: A3) Russian period.

KUNASHIR: Yuzhno-Kuril'sk (Furukamappu). Aug. 18, 2012. T. Fukuda 2012-33.

RUBIACEAE

Galium mollugo L. [Togenashi-mugura] (Hokkaido: A3) Russian period.

KUNASHIR: Roadside between Lake Peschanoye (Tōfutsu-ko) and mouth of Andreyevka River. Aug. 18, 2012. H. Takahashi et al. 35109.

SOLANACEAE

Solanum nigrum L. [Inu-hōzuki] (Hokkaido: A3) Japanese period?

ITURUP: Kuril'sk (Shana). Aug. 25, 2012. T. Fukuda 2012-325.

ITURUP: Reydovo (Bettobu). Sep. 1, 2012. T. Fukuda 2012-622.

Note: It is recognized as a prehistorically introduced plant of Japan (Shimizu 2003) but as a naturalized plant of Hokkaido (Igarashi 2001). In the Kurils, this species is only found on

vacant land around settlements, so we regarded it as a naturalized plant of the Kurils, according to the opinion of Barkalov (2009).

2. Age of the introduction to the southern Kurils

Based on the literature (Miyabe, 1980; Tatewaki, 1957; Igarashi, 2001; Smirnov, 2002; Barkalov, 2009) and our own expedition's results, we inferred the naturalized species found in the region of Japan, Sakhalin and the Kurils, presented in Table 1. From all the 280 species, 221 had been introduced to the Kurils. There were 46 species naturalized to the Kurils on the prehistoric to the Japanese period, 154 during Russian period, and 21 new aliens found in our expedition. Another 59 plants, found in this region (e.g. on Hokkaido or Sakhalin), have not been recorded from the Kurils. The results indicated that the number of naturalized to the Kuril Islands is increasing, especially in the recent period.

Many species estimated to have been introduced in the prehistoric to Japanese period are those commonly seen in the natural environment, such as *Plantago major* L., *Poa annua* L., *Persicaria nepalensis* (Meisn.) H.Gross, *Trifolium repens* L., *T. pratense* L. and others. Barkalov (2009) described the naturalized species commonly found on almost all the Kuril Islands: *Phleum pratense* L., *Poa annua* L., *Stellaria media*, *Trifolium repens* L., *T. pratense* L., *Agrostis gigantea* Roth, *Leucanthemum vulgare* Lam., *Rudbeckia laciniata* L. and *Taraxacum officinale* Weber ex F. H. Wigg. Among them, the presence of five species (*Phleum pratense*, *Poa annua*, *Stellaria media*, *Trifolium repens*, *T. pratense*) is attributed to this period. *Taraxacum officinale* is not noted either in Miyabe (1890) or Tatewaki (1957), but Tatewaki listed 10 species of *Taraxacum*, including invasive *T. laviegatum* DC. Thus, *T. officinale* possibly also invaded in the Japanese period.

In the Russian period, 154 introduced species were recorded. This means that during the 50 years of this period, the number of introduced species increased was three times higher than in the prehistoric to Japanese period, although this number may include plants that were introduced once but will not become naturalized. The large percentage of Asteraceae and Poaceae are distinctive. Of the 154 species, 38 species (24.7%) are Asteraceae and 27 species (17.5%) are Poaceae. Common alien species of the Kurils that Barkalov (2009) indicated, e.g. *Agrostis gigantea* (Poaceae), *Leucanthemum vulgare* (Asteraceae), and *Rudbeckia laciniata* (Asteraceae), are all included in this period, showing their comparably rapid ratio of dispersal. Many species of this invasive period grow around settlements and fields, as *Plantago lanceolata* L., *Erigeron annuus* (L.) Pers., *Thlaspi arvense* L., *Digitaria ciliaris* (Retz.) Koeler, *Anthoxanthum odoratum* L. and others. Human activity seems to have provided suitable conditions for their growth. Some species of the Poaceae may have been introduced as pasture grass; *Lolium perenne* L., *Echinochloa crus-gali* (L.) P.Beauv. and others belong to this period. On the other hand, we noted many plants that seemed to have escaped from cultivation: *Impatiens glandulifera* Royle, *Symphytum × uplandicum* Nyman, *Rudbeckia hirta*, *R. laciniata* and others.

In the newest period, species categorized as A2–A3 in the Blue list of Hokkaido (Hokkaido, 2010) included *Aegopodium podagraria* L., *Solidago gigantea* Aiton subsp. *serotina* (Kuntze) McNeill and *Cakile edentula* (Bigelow) Hook.. These may harm native plants, as already observed on Hokkaido or Honshu, and their occurrence in the Kurils will need to be monitored for a long period. In addition, we found a high percentage of plants that escaped from cultivation: *Rudbeckia laciniata* L. 'Hortensis', *Rudbeckia hirta*, *Achillea ptarmica* (double-petaled form) and others. *Melilotus officinalis* (L.) Pall. subsp. *suaveolens* (Ledeb.) H. Ohashi and *Trifolium campestre* Schreb. were found along asphalt roads, and may have been introduced during infrastructure construction.

3. Phytogeographic comparisons between the southern Kurils, Sakhalin and Japan

Alien plants of 280 species were compared regionally. Among 280 species, 221 were found in the Kuril Islands. For the southern Kurils, the number of alien plants was highest on Kunashir (174). The number was lower on Iturup (133), Shikotan (83) and the Habomai Islands (40).

Among the 221 alien plants of the Kuril Islands, 124 species (56.1%) were seen both in Hokkaido and on Sakhalin, 49 (22.2%) were found on Hokkaido but not on Sakhalin, and 30 (13.6%) were found on Sakhalin but not on Hokkaido. There were 16 species (7.2%) found only on the Kuril Islands, not in adjacent regions (e. g. Hokkaido, Sakhalin), and more than 90 % of the alien species of the Kuril Islands had species common with adjacent regions.

Comparison of the alien species found on Kunashir and Iturup revealed the tendency for more plants on Kunashir to be common to Hokkaido (138 plants, 83.1%) than those on Sakhalin (126 plants, 72.4%), but on Iturup, more plants were common to Sakhalin (101 plants, 75.9%) than to Hokkaido (89 plants, 66.9%). Both of the islands had plants commonly seen in wastelands or fields, such as *Taraxacum officinale*, *Plantago lanceolata* and *Gnaphalium uliginosum* L. The plants observed on Kunashir but not on Iturup often included escaped plants from gardens, such as *Narcissus pseudonarcissus* L., *Aster novi-belgii* L., *Impatiens glandulifera* Royle, and *Iris pseudacorus* L. Among the alien plants found only on Iturup were species widely distributed in northern hemisphere, such as *Galeopsis ladanum* L., *Rhinanthus vernalis* (N.W.Zinger) Schischk. & Serg., species of genus *Odonites* and others.

Interestingly, on Kunashir and Iturup, several species were found that are not seen in adjacent regions, such as *Amaranthus blitoides* S. Watson, *Euclidium syriacum* (L.) W. T. Aiton and *Campanula latifolia* L.. In addition to the geographic conditions, climate, and dimensions of these islands, frequent traffic to these islands with Sakhalin by air and ship may promote the invasion of nonnative species.

Examining regional relationships in accordance with the introduced period, it is seen that 39 species (84.8%) that were

introduced in the prehistoric to Japanese period cover all regions of Hokkaido, Sakhalin and the Kuril Islands. However, among the plants that invaded in Russian period, 79 species (51.3%) cover all these regions, while other species are still limited in distribution area. In the future, some of these plants, successfully naturalized, will enlarge their distribution. Some alien plants, which were newly found, seem to be introduced along with infrastructure constructions, and such plants may increase, especially along main roads and settlements. On the other hand, 59 species of naturalized plants in Hokkaido and part of Sakhalin have not yet introduced to the Kurils. Many of them have high rank of menace on the Blue list of Hokkaido (2010), A2 or A3, and efforts should be made to prevent their new invasion to the Kuril Islands.

4. Plants of careful treatment

Among newly invading plants, special attention should be paid to the following plants.

1) *Rudbeckia laciniata* L.

This species formed thick, dense colonies of 20–50m square around the mouth of the Tyatina River (Onnebetsu-gawa) at the southwestern foot of Mt. Tyatya. These plants were also observed along the way to the region. Local people consider that they invaded during the period of Japanese settlement, or were introduced afterward during the period of Sovkhoz farm management. The species is considered to have originally escaped from cultivation. It is one of the most harmful naturalized plant in Hokkaido (A2), and in some localities in Hokkaido, it is periodically removed by volunteers.

2) *Solidago gigantea* Aiton

This species is included within 26 vascular plants on the list of “100 of Japan’s worst invasive alien species (Ecological society of Japan 2002)”. In Japan, the species was imported as horticultural purpose and rapidly enlarged its distribution area after naturalization, harming the natural environment; on Hokkaido, it seems more invasive than *Solidago altissima* L.. Some patches were observed in Kuril’sk (Shana), a central village on Iturup. They were observed along the main roads with a 2–3 km range, among settlements and in large meadow on the way to Lake Lebedinoe (Shana-ko). In the meadow, the plants formed almost a sole community of this species. As we did not see these plants in other areas, it seems to have invaded quite recently. It is recommended to remove it while its distribution is limited near the village.

3) *Cakile edentula* (Bigelow) Hook.

This is a plant originally native to eastern North America. The plant is known to be dispersed by sea currents, and is now found in coastal areas of North America, part of Australia and recently of Japan and adjacent regions. During the expedition, we found it in a coastal area of Kunashir Island in mass, and on Iturup sporadically. Though the effect of its occurrence is still unknown, it may compete with coastal vegetation as *Salsola komarovii* Iljin, and possibly with *Mertensia maritima* (L.) Gray or *Honckenya peploides* (L.) Ehrh. var. *major* Hook. Details are in Fukuda et al.

(2013).

4) *Aegopodium podagraria* L.

We observed only a few individuals that were cultivated in a garden of Yuzhno-Kuril'sk (Furukamappu) on Kunashir. It can become a harmful invasive plant, as seen on Hokkaido (A2). On Hokkaido, it occurs widely under forests, especially around the Sapporo area. Careful treatment will be needed to prevent it from escaping.

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福田知子¹, Taran, A.², 佐藤広行³, 加藤ゆき恵⁴, 高橋英樹⁵:
2010-2012 年に確認された色丹・国後・択捉島の外来植物

2010 年に色丹島、2009、2012 年に国後・択捉島にて、外来植物の侵入状況についての調査を行った。これまで千島を含む極東地域から報告があった外来植物 280 分類群のうち、日本時代までに侵入したと思われるものは 46、ロシア時代は 154 分類群であり、今回新たに 21 分類群を確認した。外来植物の侵入は戦後のロシア時代以降増加の傾向が見られ、特にキク科、イネ科植物の侵入が目立った。千島の外来植物は 9 割以上が近隣地域と共通し、約 8 割が北海道と共通する植物であった。島ごとに見ると国後は北海道と、択捉はサハリンとの共通種が多く、択捉には北半球に広く分布するが北海道などには侵入していない外来植物が多くみられた。国後・択捉では他の島よりも多くの外来植物が侵入していたが、その理由としては、住宅地・畑作などによって、外来植物が定着しやすい環境があること、栽培からの逸出の機会が多いこと他に、両島では空路・海路により、サハリン・北海道など他地域との交流が多い

ことも大きな要因であると考えられる。今回新たに確認した植物の中には、オオアワダチソウ、オオハンゴンソウなど、日本でも問題になっている植物が含まれ、今後も継続的観察が必要である。

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⁴ 釧路市立博物館,

⁵ 北海道大学総合博物館)



Fig. 1. Distribution of *Cakile edentula* (Bigel.) Hook. around Japan. Large map indicate localities, reported for the occurrence of the plants by literatures (in round brackets), and by specimens (in square brackets). Small map with Kunashir & Iturup shows our result on population size of the plant. Specimen data provided by: Akita Prefectural Museum (AKPM), Fukushima University (FKSE), Ibaraki Nature Museum (INM) and National Museum of Nature and Science (TNS), accessed through S-Net data portal, <http://science-net.kahaku.go.jp/>.

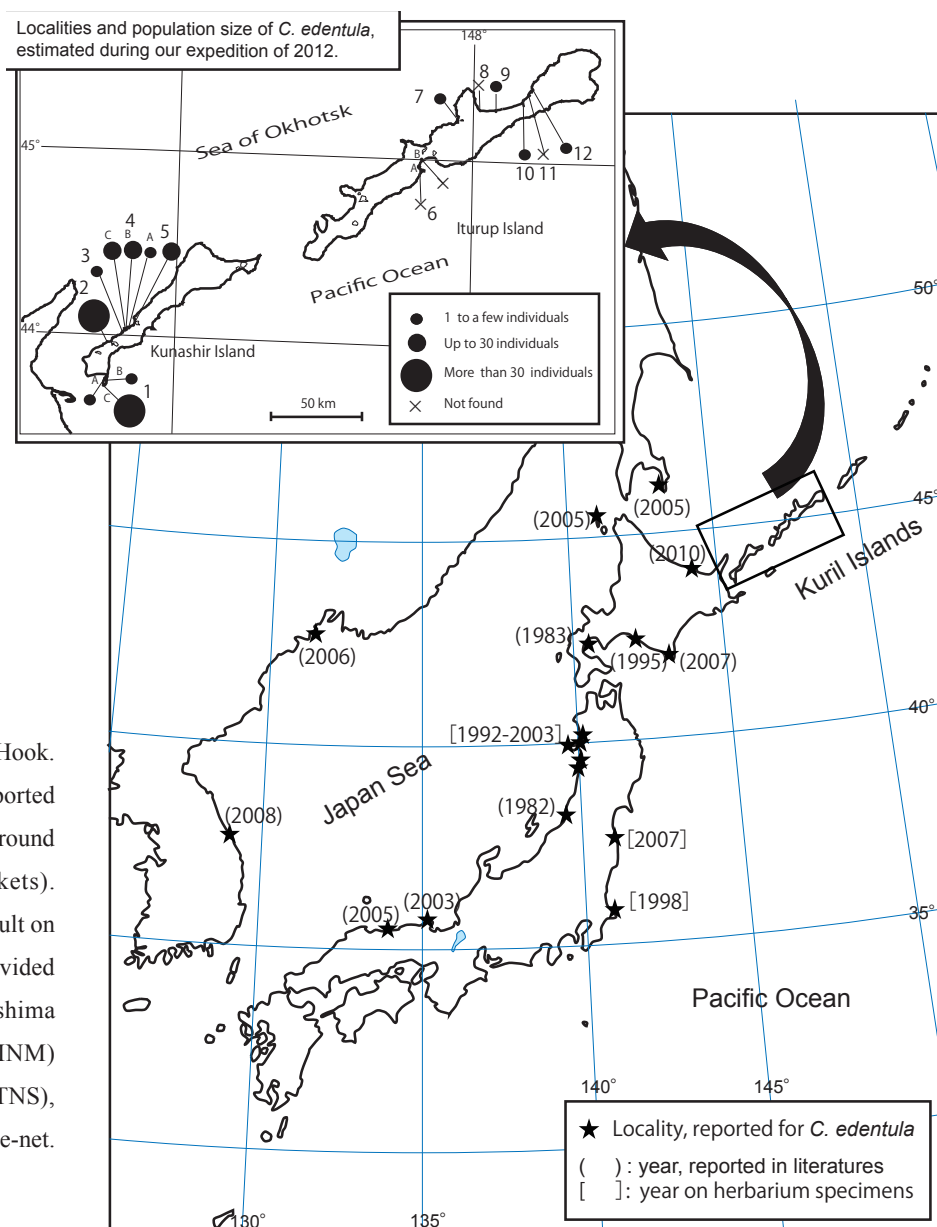


Table. 1. Naturalized Vascular Plants in Honshu-Hokkaido - Sakhalin-Kuril Islands-Kamchatka.

Family	Scientific names in Japan 1)	JAPANESE NAME	Distribution by literatures 2)											Our result 3)			Period 4)
			Hon.	Hok.	Hab.	SHK	KUN	ITU	Ur-At	State	Q-tity	Sakh	Kam	SHK	KUN	ITU	
Amaranthaceae	<i>Chenopodium album</i>	Shiroza	+	B	●	○●	○●	○●	○●	AL	OF	+	(+)		◆	◆	Ai
Asteraceae	<i>Matricaria matricarioides</i>	Koshika-giku	(+)	B	●	○●	○●	○●	○●	AL	OF	(+)	(+)		◆	◆	Ai
Brassicaceae	<i>Capsella bursa-pastoris</i>	Nazuna	+	+		○●	○●	○●	●	AL	OF	+	(+)		◆	◆	Ai
Caryophyllaceae	<i>Cerastium holosteoides</i>	Mimina-gusa	+	+	●	●	○●	○●	○●	AL	OF	(+)	(+)			◆	Ai
Caryophyllaceae	<i>Stellaria media</i>	Ko-hakobe	+	A3	●	○●	○●	○●	○●	AL	OF	(+)	(+)			◆	Ai
Plantaginaceae	<i>Plantago major</i>	Seiyo-obako	(+)	B				●	●	AL	RA	(+)	(+)		◆		Ai
Poaceae	<i>Poa annua</i>	Suzume-no-katgir	+	+	●	○●	○●	○●	○●	AL	VO	+	(+)		◆	◆	Ai
Poaceae	<i>Poa pratensis</i>	Nagaha-gusa	(+)	A3	●	○●	○●	○●	○●	AL	OF	+	+		◆	◆	Ai
Polygonaceae	<i>Polygonum aviculare</i>	Michiyanagi	+	+	●	○●	○●	○●	●	AL	RA	+	(+)			◆	Ai
Asteraceae	<i>Conyza canadensis</i>	Hime-mukashi-yomogi	(+)	A3		○●	●			AL	OF	(+)	+				Jp
Asteraceae	<i>Senecio vulgaris</i>	Noboro-giku	(+)	A3		○●	○●	○●	○●	AL	RA	(+)	(+)	◆		◆	Jp
Asteraceae	<i>Sonchus asper</i>	Oni-nogeshi	(+)	B		○●	○●	○●		AL	RA	(+)	+				Jp
Asteraceae	<i>Taraxacum laevigatum</i>	Akami-tanpopo	(+)	A3		○●	●		●	AL	RA	(+)	(+)				Jp
Asteraceae	<i>Taraxacum officinale</i>	Seiyo-tanpopo	(+)	A2	●	●	●	●	●	AL	OF	(+)	(+)		◆	◆	Jp ?
Boraginaceae	<i>Cynoglossum asperum</i>	Oni-ruriso	+	+			○●			AL	RA	+	+				Jp
Brassicaceae	<i>Arabis hirsuta</i>	Yama-hatazao	+	+			●	○●	●	AL	OF	+	+				Jp
Brassicaceae	<i>Sisymbrium officinale</i>	Kakine-garashi	(+)	B		○●	○●	●		AL	RA	(+)	+				Jp
Brassicaceae	<i>Turritis glabra</i>	Hatazao	+	+		○●	○●	○●		AL	OF	(+)	+				Jp
Campanulaceae	<i>Campanula latifolia</i>	Giant bell flower	+	+			○●			AL	+	+	+				Jp
Caryophyllaceae	<i>Silene noctiflora</i>	Tsukimi-senno	(+)	B		○●	○●			AL	RA	(+)	+				Jp
Caryophyllaceae	<i>Spergula arvensis</i>	Nohara-tsumekusa	(+)	A3		○●	●	●	●	AL	OF	(+)	(+)				Jp
Commelinaceae	<i>Commelina communis</i>	Tsuyu-kusa	+	+		●	○●	○●	●	AL	RA	+	(+)				Jp
Fabaceae	<i>Trifolium pratense</i>	Murasaki-tsumekusa	(+)	A2	●	○●	○●	○●	○●	AL	OF	(+)	(+)		◆	◆	Jp
Fabaceae	<i>Trifolium repens</i>	Shiro-tsumekusa	(+)	A2	●	○●	○●	○●	○●	AL	OF	(+)	(+)		◆	◆	Jp
Geraniaceae	<i>Geranium sibiricum</i>	Ichige-furo	+	+	●	○●	○●	○●	●	AL	OF	+	(+)			◆	Jp
Juncaceae	<i>Juncus bufonius</i>	Hime-Kogai-zekisho	+	+	●	●	●	●	●	AL	OF	+	+		◆	◆	Jp ?
Juncaceae	<i>Juncus tenuis</i>	Kusa-i	+	+	●	●	●	●	●	AL	OF	+	+		◆	◆	Jp ?
Lamiaceae	<i>Elsholtzia ciliata</i>	Naginata-koju	+	+		●	●	●	●	AL	RA	+	(+)			◆	Jp ?
Lamiaceae	<i>Galeopsis bifida</i>	Chishima-odoriko-so	(+)	A3		○●	○●	○●	●	AL	GR	+	(+)	◆		◆	Jp ?
Lamiaceae	<i>Lamium amplexicaule</i>	Hotoke-no-za	+	B		●	●	○●		AL	RA	+	+				Jp
Onagraceae	<i>Oenothera biennis</i>	Me-matsuyoi-gusa	(+)	A3	●	●	●	●		AL	OF	(+)	(+)		◆	◆	Jp
Onagraceae	<i>Oenothera erythrosepala</i>	O-matsuyoi-gusa	(+)	A3			○●			AL	RA	+	+				Jp
Onagraceae	<i>Oenothera salicifolia</i>	Matsuyoi-gusa zoku	+	+			○●	○●		AL	RA	+	+				Jp
Plantaginaceae	<i>Veronica scutellata</i>	Hosoba-kawadzisha	+	+			○●	○●		AL	RA	(+)	+				Jp
Poaceae	<i>Agrostis stolonifera</i>	Hai-konuka-gusa	(+)	B	●	○●	○●	○●	●	[NA]	OF	(+)	+				Jp
Poaceae	<i>Avena fatua</i>	Karasu-mugi	(+)	B			○●		●			(+)	+				Jp
Poaceae	<i>Dactylis glomerata</i>	Kamo-gaya	(+)	A3	●	○●	○●	○●	○●	AL	OF	(+)	(+)		◆	◆	Jp
Poaceae	<i>Phleum pratense</i>	O-awagaeri	(+)	A3	●	○●	○●	○●	○●	AL	VO	(+)	(+)		◆	◆	Jp
Polygonaceae	<i>Fallopia convolvulus</i>	Soba-kazura	(+)	B		○●	○●	○●	●	AL	OF	+	(+)				Jp
Polygonaceae	<i>Fallopia dumetorum</i>	Tsuru-tade	(+)	B		○●	○●			[NA]	OF	+	+				Jp
Polygonaceae	<i>Persica lapathifolia</i> var. <i>incana</i>	Sanae-tade	+	+		●	○●	○●	○●	AL	RA	+	(+)				Jp
Polygonaceae	<i>Persicaria nepalensis</i>	Tani-soba	+	+		●	●	●		AL	OF	+	+		◆		Jp
Polygonaceae	<i>Rumex acetosella</i> var. <i>pyrenaicus</i>	Hime-suiba	(+)	A3	●	○●	○●	○●	○●	AL	OF	+	(+)		◆	◆	Jp
Polygonaceae	<i>Rumex longifolius</i>	Nodaio	+	+	●	○●	○●	○●	●	AL	OF	+	(+)	◆	◆	◆	Jp
Polygonaceae	<i>Rumex obtusifolius</i>	Ezo-no-gishigishi	(+)	A3	●	●	○●	●	●	AL	OF	(+)	+		◆	◆	Jp
Solanaceae	<i>Solanum nigrum</i>	Inu-hozuki	(+)	A3		○●	○●	○●	●	AL	OF	(+)	+			◆	Jp
Alismataceae	<i>Alisma plantago-aquatica</i> var. <i>orientale</i>	Saji-omodaka	+	+		●	●			AL	RA	(+)	+				Ru
Amaranthaceae	<i>Amaranthus blitoides</i>	Amerika-biyu	(+)	+				●		AL	RA	+	+				Ru
Amaranthaceae	<i>Chenopodium glaucum</i>	Urajiro-akaza	(+)	B		●				AL	+	+	(+)				Ru
Amaranthaceae	<i>Chenopodium hybridum</i>	Usaba-akaza	(+)	B		●				AL	RA	+	+				Ru
Amaryllidaceae	<i>Narcissus poeticus</i>	Kuchibeni-zuisen	(+)	B	●	●	●			CU	+	+	+				Ru
Amaryllidaceae	<i>Narcissus pseudonarcissus</i>	Rappa-zuisen	(+)	B	●	●	●			CU	+	+	+				Ru
Apiaceae	<i>Angelica edulis</i>	Ama-nyu	+	+						CU	RA	+	+				Ru
Apiaceae	<i>Carum carvi</i>	Kyarawei	+	+			●	●	●	AL	RA	(+)	(+)				Ru
Apiaceae	<i>Conium maculatum</i>	Doku-ninjin	(+)	A3			●			AL	RA	(+)	+				Ru
Araceae	<i>Acorus calamus</i>	Shoubu	+	+			●			AL	RA	+	+				Ru
Asteraceae	<i>Achillea alpina</i> ssp. <i>alpina</i>	Nokogiri-so	+	+			●			AL	OF	+	+				Ru
Asteraceae	<i>Achillea millefolium</i>	Seiyo-Nokogiriso	(+)	A3	●	●	●		●	AL	OF	(+)	(+)		◆	◆	Ru
Asteraceae	<i>Achillea nigrescens</i>	Nokogiri-so zoku	+	+				●	●	AL	RA	+	(+)				Ru
Asteraceae	<i>Arctium lappa</i>	Gobo	(+)	A3		●	●	●		AL	OF	(+)	(+)		◆	◆	Ru
Asteraceae	<i>Arctium tomentosum</i>	Gobo zoku	+	+		●	●	●		AL	OF	(+)	(+)		◆	◆	Ru
Asteraceae	<i>Artemisia feddei</i>	Hime-yomogi	+	A3			●			AL	RA	+	+				Ru
Asteraceae	<i>Artemisia vulgaris</i>	Yomogi zoku	+	+			●			AL	RA	(+)	(+)				Ru
Asteraceae	<i>Aser novi-belgii</i>	Yuzen-giku	(+)	A3			●			CU	RA	(+)	+				Ru
Asteraceae	<i>Bellis perennis</i>	Hina-giku	(+)	B			●	●		CU	OF	(+)	+			◆	Ru
Asteraceae	<i>Bidens frondosa</i>	Amerika-sendan-gusa	(+)	A3		●	●	●		AL	RA	+	+				Ru
Asteraceae	<i>Bidens radiata</i>	Ezo-no-taukogi	+	+		●	●	●		AL	OF	+	+			◆	Ru
Asteraceae	<i>Bidens tripartita</i>	Taukogi	+	+			●			AL	RA	+	+				Ru
Asteraceae	<i>Breia setosa</i>	Ezo-no-kitsune-azami	+	+		●		●	●	AL	OF	+	(+)				Ru
Asteraceae	<i>Centaurea jacea</i>	Yaguruma-azami	(+)	B			●			AL	RA	+	+			◆	Ru
Asteraceae	<i>Centaurea scabiosa</i>	Yaguruma-azami zoku	+	+				●		AL	RA	(+)	(+)				Ru
Asteraceae	<i>Cichorium intybus</i>	Kiku-nigana	(+)	B	●		●	●		AL	RA	(+)	+				Ru
Asteraceae	<i>Cirsium vulgare</i>	Amerika-oni-azami	(+)	A2		●	●	●		AL	RA	(+)	+			◆	Ru
Asteraceae	<i>Cotula coronopifolia</i>	Ushio-shika-giku	(+)	+			●			AL	RA	(+)	+				Ru
Asteraceae	<i>Erigeron annuus</i>	Hime-joon	(+)	A3			●			AL	RA	(+)	+		◆		Ru
Asteraceae	<i>Erigeron strigosus</i>	Heraba-hime-joon	+	B			●					+	+		◆		Ru
Asteraceae	<i>Phalacrolooma septentrionale</i>	Mukashi-yomogi zoku	+	+		●	●	●		AL	GR	(+)	+				Ru
Asteraceae	<i>Galinsoga parviflora</i>	Kogome-giku	(+)	B			●			AL	RA	+	+		◆		Ru
Asteraceae	<i>Gnaphalium pilulare</i>	Hahako-gusa zoku	+	+		●	●	●		AL	OF	+	+				Ru
Asteraceae	<i>Gnaphalium sylvaticum</i>	Edauchi-chichiko-gusa	(+)	B		●	●	●	●	AL	OF	(+)	(+)			◆	Ru
Asteraceae	<i>Gnaphalium uliginosum</i>	Hime-chichiko-gusa	+	B	●	●	●	●	●	AL	OF	(+)	+		◆	◆	Ru
Asteraceae	<i>Helianthus tuberosus</i>	Kiku-imo	(+)	A3			●	●		CU	+	(+)	+				Ru

Family	Scientific names in Japan 1)	JAPANESE NAME	Distribution by literatures 2)											Our result 3)			Period 4)	
			Hon.	Hok.	Hab	SHK	KUN	ITU	Ur-At	State	Q-tity	Sakh	Kam	SHK	KUN	ITU		
Asteraceae	<i>Hieracium aurantiacum</i>	Korin-tanpopo	(+)	A2	●		●	●	●		AL	RA	(+)	(+)				Ru
Asteraceae	<i>Pilosella floribunda</i>	Yanagi-tanpopo zoku	•	•			●				AL	RA	(+)	(+)				Ru
Asteraceae	<i>Lactuca indica</i>	Aki-no-nogeshi	+	+			●				AL	•	•	•				Ru
Asteraceae	<i>Leontodon autumnalis</i>	Aki-no-tanpopo-modoki	•	D		●	●	●	●		AL	OF	(+)	(+)	◆	◆		Ru
Asteraceae	<i>Leucanthemum vulgare</i>	Furansu-giku	(+)	A2			●	●	●		AL	OF	(+)	(+)	◆			Ru
Asteraceae	<i>Matricaria perforata</i>	Inu-kamitsure	(+)	A3	●	●	●				AL	RA	(+)	+				Ru
Asteraceae	<i>Rudbeckia hirta</i>	Arage-hangonso	(+)	B			●				AL	RA	•	•	◆			Ru
Asteraceae	<i>Rudbeckia laciniata</i>	O-hangonso	(+)	A2			●				CU	OF	•	•	◆			Ru
Asteraceae	<i>Sonchus arvensis</i>	Taiwan-hachijo-na	(+)	B	●	●	●	●	●		AL	RA	+	(+)				Ru
Asteraceae	<i>Sonchus oleraceus</i>	Haru-no-nogeshi	+	+			●	●			AL	RA	(+)	(+)				Ru
Asteraceae	<i>Taraxacum heterolepis</i>	Tanpopo zoku	•	•			●	●	●		AL	RA	(+)	(+)				Ru
Asteraceae	<i>Xanthium sibiricum</i>	Onamomi	+	+			●	●			AL	RA	+	•				Ru
Balsaminaceae	<i>Impatiens glandulifera</i>	Oni-tsurifune-so	(+)	A3		●	●				AL	OF	(+)	•	◆			Ru
Boraginaceae	<i>Borago officinalis</i>	Ruri-jisa	(+)	(+)			●	●			AL	RA	(+)	(+)				Ru
Brassicaceae	<i>Armoracia rusticana</i>	Seiyo-wasabi	(+)	A3		●	●	●			CU	OF	(+)	(+)				Ru
Brassicaceae	<i>Brassica juncea</i>	Karashina	(+)	B		●	●	●	●		AL	RA	(+)	•				Ru
Brassicaceae	<i>Brassica rapa</i> var. <i>oleifera</i>	Aburana	(+)	(+)			●	●	●		AL	RA	(+)	(+)		◆		Ru
Brassicaceae	<i>Erysimum cheiranthoides</i>	Ezo-suzushiro	(+)	B			●		●		AL	RA	+	+				Ru
Brassicaceae	<i>Euclidium syriacum</i>	Euclidium zoku	•	•			●				AL	RA	•	•				Ru
Brassicaceae	<i>Eutrema japonica</i>	Wasabi	+	B			●				[NA]	VR	+	•				Ru
Brassicaceae	<i>Hesperis matronalis</i>	Hana-suzushiro	•	B				●			AL	RA	•	•				Ru
Brassicaceae	<i>Raphanus raphanistrum</i>	Seiyo-no-daikon	(+)	B			●	●	●		AL	OF	(+)	(+)		◆		Ru
Brassicaceae	<i>Thlaspi arvense</i>	Gunbai-nazuna	(+)	B			●				AL	RA	(+)	(+)				Ru
Caryophyllaceae	<i>Sagina procumbens</i>	Araito-tsumekusa	(+)	B		●	●	●	○●		AL	OF	(+)	(+)		◆		Ru
Caryophyllaceae	<i>Silene alba</i>	Matsuyoi-senno	(+)	A3			●	●	●		AL	RA	+	(+)				Ru
Caryophyllaceae	<i>Silene vulgaris</i> (Oberna behen)	Siratama-so	(+)	B	●	○	●	●	●		AL	RA	(+)	(+)		◆		Ru
Caryophyllaceae	<i>Spergularia rubra</i>	Usubeni-tsumekusa	(+)	B		●	●	●	●		AL	OF	(+)	(+)		◆		Ru
Caryophyllaceae	<i>Stellaria graminea</i>	Karafuto-hosoba-hakobe	(+)	A3			●	●			AL	RA	(+)	(+)	◆	◆		Ru
Convolvulaceae	<i>Convolvulus arvensis</i>	Seiyo-hirugao	(+)	A3			●	●	●		AL	RA	(+)	•		◆		Ru
Cyperaceae	<i>Carex crawfordii</i>	Kushiro-yagami-suge	•	B			●		●		AL	RA	•	•				Ru
Cyperaceae	<i>Carex laevissima</i>	Hime-mikoshi-gaya	+	•			●	●			AL	RA	+	•				Ru
Elaeagnaceae	<i>Elaeagnus multiflora</i> var. <i>hortensis</i>	To-gumi	+	+			●				CU	RA	(+)	•				Ru
Euphorbiaceae	<i>Acalypha australis</i>	Enoki-gusa	+	+			●				AL	RA	•	•				Ru
Fabaceae	<i>Astragalus danicus</i>	Genge zoku	•	•					●		AL	RA	•	(+)				Ru
Fabaceae	<i>Lathyrus pratensis</i>	Kibana-no-renriso	(+)	D			●	●			AL	RA	(+)	(+)				Ru
Fabaceae	<i>Lupinus nootakensis</i>	Lupinus	•	•			●	●			CU	OF	(+)	•				Ru
Fabaceae	<i>Robinia pseudoacacia</i>	Hari-enju	(+)	A2			●	●			AL	OF	(+)	•				Ru
Fabaceae	<i>Trifolium hybridum</i>	Tachi-oranda-geenge	(+)	A3	●	●	●		●		AL	RA	(+)	(+)		◆		Ru
Geraniaceae	<i>Erodium cicutarium</i>	Oranda-furo	(+)	B			●				AL	RA	•	(+)				Ru
Grossulariaceae	<i>Ribes uva-crispa</i>	Maru-suguri	(+)	B		●	●	●			CU	•	•	•				Ru
Iridaceae	<i>Iris pseudacorus</i>	Ki-shobu	(+)	A2	●		●				CU	OF	(+)	•				Ru
Iridaceae	<i>Sisyrinchium septentrionale</i>	Niwazekisho zoku	•	•			●				AL	RA	•	•				Ru
Juncaceae	<i>Juncus nodulosus</i>	Igusa zoku	•	•			●	●			AL	OF	+	+				Ru
Lamiaceae	<i>Elsholtzia pseudocristata</i>	Naginata-koju zoku	•	•		●	●	●			AL	RA	•	•				Ru
Lamiaceae	<i>Galeopsis tetrahit</i>	Tanuki-jiso	•	•		●					AL	RA	•	(+)				Ru
Lamiaceae	<i>Galeopsis ladanum</i>	Chishima-odorikoso zoku	•	•				●			AL	RA	(+)	(+)				Ru
Lamiaceae	<i>Nepeta cataria</i>	Inu-hakka	(+)	B			●				AL	•	•	•				Ru
Liliaceae	<i>Lilium lancifolium</i>	Oni-yuri	(+)	B			●	●			CU	RA	(+)	•				Ru
Malvaceae	<i>Malva moschata</i>	Jako-aoi	(+)	A3			●	●			AL	RA	(+)	•				Ru
Moraceae	<i>Cannabis sativa</i>	Asa	(+)	A3					●		IN	•	(+)	(+)				Ru
Orobanchaceae	<i>Odonites vulgaris</i>	Odonitesu zoku	•	•				●			AL	RA	(+)	(+)				Ru
Orobanchaceae	<i>Rhinanthus angustifolius</i>	Okuezo-garagara	•	•			●	●			AL	RA	(+)	(+)	◆	◆		Ru
Orobanchaceae	<i>Rhinanthus aestivalis</i>	Okuezo-garagara zoku	•	•			●	●			AL	RA	•	•				Ru
Orobanchaceae	<i>Rhinanthus vernalis</i>	Okuezo-garagara zoku	•	•				●			AL	RA	(+)	(+)				Ru
Oxalidaceae	<i>Oxalis corniculata</i>	Katabami	+	+			●				AL	RA	•	•				Ru
Pinaceae	<i>Larix kaempferi</i>	Kara-matsu	+	B		●	●				IN	•	(+)	•				Ru
Plantaginaceae	<i>Plantago lanceolata</i>	Hera-obako	(+)	A2			●	●			AL	RA	(+)	(+)		◆		Ru
Plantaginaceae	<i>Plantago media</i>	Shirobana-obako	•	•		●	●				AL	RA	(+)	(+)				Ru
Plantaginaceae	<i>Digitalis purpurea</i>	Kitsuneno-tebukuro	(+)	A3			●	●	●		CU	RA	(+)	•				Ru
Plantaginaceae	<i>Linaria vultgaris</i>	Hosoba-unran	(+)	A3	●						AL	RA	(+)	(+)				Ru
Plantaginaceae	<i>Veronica chamaedrys</i>	Karafuto-hiyoku-so	(+)	B			●	●	●		AL	RA	(+)	•				Ru
Plantaginaceae	<i>Veronica persica</i>	O-inuno-fuguri	(+)	B			●	●	●		AL	RA	(+)	•				Ru
Poaceae	<i>Agrostis capillaris</i>	Ito-konuka-gusa	(+)	D	●		●	●	●		AL	OF	•	•				Ru
Poaceae	<i>Agrostis gigantea</i>	Konuka-gusa	(+)	A3	●	●	●	●	●		AL	OF	(+)	(+)	◆	◆		Ru
Poaceae	<i>Alopecurus arundinaceus</i>	Suzume-no-teppo zoku	•	•					●		AL	RA	•	•				Ru
Poaceae	<i>Alopecurus geniculatus</i>	Suzume-no-teppo zoku	•	•			●	●	●		AL	RA	(+)	(+)				Ru
Poaceae	<i>Anthoxanthum odoratum</i>	Haru-gaya	(+)	A3			●	●	●		AL	OF	(+)	•	◆			Ru
Poaceae	<i>Avena fatua</i>	Karasu-mugi zoku	•	•				●			AL	RA	(+)	(+)				Ru
Poaceae	<i>Bromus inermis</i>	Ko-suzume-no-chahiki	(+)	A3			●				AL	RA	(+)	(+)	◆	◆		Ru
Poaceae	<i>Cynosurus cristatus</i>	Kushi-gaya	(+)	D			●				AL	RA	•	•				Ru
Poaceae	<i>Deschampsia caespitosa</i>	Hiroha-no-komesusuki	•	•					●		AL	OF	(+)	(+)				Ru
Poaceae	<i>Digitaria ciliaris</i>	Mehishiba	+	+			●				AL	RA	•	•				Ru
Poaceae	<i>Digitaria ischaemum</i>	Kita-mehishiba	+	+			●				AL	RA	•	(+)				Ru
Poaceae	<i>Digitaria violascens</i>	Aki-mehishiba	+	+			●				AL	RA	•	•				Ru
Poaceae	<i>Echinochloa crus-galli</i>	Inubie	+	+			●				AL	RA	+	(+)				Ru
Poaceae	<i>Echinochloa occidentalis</i>	Inubie zoku	•	•			●				AL	•	•	•				Ru
Poaceae	<i>Elymus repens</i>	Shiba-mugi (incl. Noge~)	(+)	A3	●	●	●	●	●		AL	OF	+	(+)	◆	◆		Ru
Poaceae	<i>Elymus novae-angliae</i>	Ezomugi zoku	•	•				●			AL	RA	•	(+)				Ru
Poaceae	<i>Festuca arundinacea</i>	Oni-ushinoke-gusa	(+)	A3			●				AL	RA	•	•				Ru
Poaceae	<i>Festuca pratensis</i>	Hiroha-no-ushinoke-gusa	(+)	A3	●		●	●	●		AL	OF	(+)	(+)	◆			Ru
Poaceae	<i>Holcus lanatus</i>	Shirage-gaya	(+)	B	●		●		●		AL	OF	•	•	◆			Ru
Poaceae	<i>Hordeum brachyantherum</i>	Chishima-mugikusa	(+)	•				●	●		[NA]	RA	•	(+)				Ru

Family	Scientific names in Japan 1)	JAPANESE NAME	Distribution by literatures 2)											Our result 3)			Period 4)
			Hon.	Hok.	Hab.	SHK	KUN	ITU	Ur-At	State	Q-tity	Sakh	Kam	SHK	KUN	ITU	
Poaceae	<i>Hordeum jubatum</i>	Hoso-noge-mugi	(+)	B	●	●		●		AL	RA	(+)	(+)				Ru
Poaceae	<i>Lolium temulentum</i>	Doku-mugi	(+)	A3				●	●	AL	RA	•	•				Ru
Poaceae	<i>Poa angustifolia</i>	Hosoba-no-nagahagusa	(+)	A3		●	●	●	●	AL	VO	(+)	(+)				Ru
Poaceae	<i>Poa compressa</i>	Ko-ichigo-tsunagi	(+)	B				●		AL	RA	(+)	(+)				Ru
Poaceae	<i>Poa trivialis</i>	O-suzumeno-katabira	(+)	A3		●	●	●		AL	RA	(+)	(+)		◆		Ru
Poaceae	<i>Puccinellia distans</i>	Chishima-dojo-tsunagi zoku	•	•					●	AL	RA	(+)	(+)				Ru
Poaceae	<i>Setaria faberi</i>	Aki-no-enokoro-gusa	+	+			●			AL	RA	+	•				Ru
Polygonaceae	<i>Aconogonon divaricatum</i>	Shiberia-iwatade	•	•			●			AL	RA	(+)	(+)				Ru
Polygonaceae	<i>Fagopyrum tataricum</i>	Dattan-soba	(+)	D		●				AL	RA	+	(+)				Ru
Polygonaceae	<i>Persicaria maculosa</i>	Haru-tade	(+)	(+)	●		●	●	●	AL	RA	•	•			◆	Ru
Polygonaceae	<i>Persicaria sagittata</i>	Unagi-tsukami	+	+		●				AL	RA	(+)	•				Ru
Polygonaceae	<i>Polygonum arenastrum</i>	Hai-michiyonagi	(+)	A3		●	●	●	●	AL	OF	+	(+)				Ru
Polygonaceae	<i>Polygonum boreale</i>	Ushio-michiyonagi	•	+			●	●		AL	OF	+	(+)				Ru
Polygonaceae	<i>Polygonum neglectum</i>	Oku-michiyonagi	•	+			●	●	●	AL	OF	+	(+)	◆	◆	◆	Ru
Polygonaceae	<i>Polygonum calcatum</i>	Michiyonagi zoku	•	•		●		●	●	AL	RA	+	(+)				Ru
Polygonaceae	<i>Polygonum rigidum</i>	Michiyonagi zoku	•	•				●	●	AL	RA	+	•				Ru
Polygonaceae	<i>Reynoutria japonica</i>	Itadori	+	A3			●			CU	RA	(+)	•				Ru
Polygonaceae	<i>Rumex acetosella</i> var. <i>acetosella</i>	Hina-suiba	(+)	•		●	●	●	●	AL	OF	+	(+)				Ru
Polygonaceae	<i>Rumex crispus</i>	Nagaba-gishigishi	(+)	A3	●	●	●	●	●	AL	RA	(+)	•				Ru
Polygonaceae	<i>Rumex patientia</i>	Gishigishi zoku	•	•		●				AL	RA	(+)	(+)				Ru
Primulaceae	<i>Androsace filiformis</i>	Saka-kozakura	(+)	B					●	AL	OF	(+)	+				Ru
Ranunculaceae	<i>Ranunculus acris</i>	Seiyo-kinpoge	•	B		●	●			AL	RA	(+)	(+)				Ru
Ranunculaceae	<i>Ranunculus sceleratus</i>	Tagarashi	+	+			●			AL	RA	(+)	(+)				Ru
Rosaceae	<i>Alchemilla micans</i>	Hagoromo-gusa zoku	•	•				●	●	AL	OF	•	•			◆	Ru
Rosaceae	<i>Malus toringo</i>	Zumi	+	+			●			CU	•	(+)	•				Ru
Rosaceae	<i>Potentilla intermedia</i>	Kijimushiro zoku	•	•			●			AL	RA	•	•				Ru
Rosaceae	<i>Potentilla norvegica</i>	Ezo-no-mitsumoto-so	(+)	A3		●	●	●	●	AL	OF	(+)	(+)		◆		Ru
Rubiaceae	<i>Galium mollugo</i>	Togenashi-mugura	(+)	A3			●			[NA]	CR	•	•		◆		Ru
Rubiaceae	<i>Galium uliginosum</i>	Yae-mugura zoku	•	•					●	AL	RA	•	•				Ru
Rubiaceae	<i>Galium vaillantii</i>	Yae-mugura zoku	•	•			●			AL	RA	(+)	(+)				Ru
Salicaceae	<i>Populus deltoides</i>	Hiroha-yamanarashi		+			●			CU	RA	(+)	•				Ru
Salicaceae	<i>Salix koriyanagi</i>	Kori-yanagi	+	B			●			CU	•	•	•				Ru
Sapindaceae	<i>Acer ginnala</i>	Karakogi-kaede	+	+			●			IN	•	•	•				Ru
Taxodiaceae	<i>Cryptomeria japonica</i>	Sugi	+	(+)			●			IN	RA	(+)	•				Ru
Ulmaceae	<i>Zelkova serrata</i>	Keyaki	+	(+)			●			IN	RA	•	•				Ru
Violaceae	<i>Viola tricolor</i>	Sanshiki-sumire	(+)	B			●			CU	•	(+)	•				Ru
Amaranthaceae	<i>Chenopodium ficifolium</i>	Ko-akaza		B							•	•	•			★	Ne
Apiaceae	<i>Aegopodium podagraria</i>	Iwa-mitsuba	(+)	A2						—	—	•	•		★		Ne
Apiaceae	<i>Daucus carota</i>	Nora-ninjin	(+)	A3						—	—	(+)	•			★	Ne
Asteraceae	<i>Achillea ptarmica</i>	Obana-nokogiri-sō		B								•	•		★	★	Ne
Asteraceae	<i>Rudbeckia laciniata</i> var. <i>hortensis</i>	Hanagasa-giku	(+)	A2								•	•		★		Ne
Asteraceae	<i>Solidago gigantea</i> var. <i>leiophylla</i>	O-Awadachi-so	(+)	A2						—	—	•	•			★	Ne
Asteraceae	<i>Tanacetum vulgare</i>	Yomogi-giku		B								•	•			★	Ne
Boraginaceae	<i>Echium vulgare</i>	Shibenaga-murasaki		B								+	•		★		Ne
Boraginaceae	<i>Symphytum x uplandicum</i>	Comfrey (Hirehari-so)	(+)	A3						—	—	•	•		★	★	Ne
Brassicaceae	<i>Brassica napus</i> L.	Seiyo-aburana	+	B								•?	•				Ne
Brassicaceae	<i>Cakile edentula</i>	Oni-hama-daikon	(+)	A3						—	—	•	•		★	★	Ne
Caryophyllaceae	<i>Saponia officinalis</i>	Sabon-so		B								+	•			★	Ne
Fabaceae	<i>Lupinus polyphyllus</i>	Shukkon-Lupinus	(+)	A3						—	—	•	•			★	Ne
Fabaceae	<i>Melilotus officinalis</i> ssp. <i>suaveolens</i>	Shinagawa-hagi	(+)	A3						—	—	(+)	(+)			★	Ne
Fabaceae	<i>Trifolium campestre</i>	Kusudama-tsumekusa		B								•	•			★	Ne
Hypericaceae	<i>Hypericum perforatum</i>	Seiyo-otogiri		B								+	•	★		★	Ne
Lamiaceae	<i>Mentha x gracilis</i>	Amerika-hakka		B								•?	•			★	Ne
Oxalidaceae	<i>Oxalis dillenii</i>	Ottachi-katabami		+								•	•	★		★	Ne
Poaceae	<i>Lolium perenne</i>	Hoso-mugi	(+)	A3					●	AL	•	(+)	•			★	Ne
Amaranthaceae	<i>Amaranthus retroflexus</i>	Ao-geitou	(+)	A3						—	—	+	•				—
Amaranthaceae	<i>Chenopodium pumilio</i>	Goshu-arita-so	(+)	A3						—	—	•	•				—
Apiaceae	<i>Aethusa cynapium</i>	Inu-ninjin	•	A3						—	—	•	•				—
Asteraceae	<i>Ambrosia artemisiifolia</i>	Butakusa	(+)	A2						—	—	(+)	•				—
Asteraceae	<i>Ambrosia trifida</i>	O-butakusa	(+)	A3						—	—	•	•				—
Asteraceae	<i>Anthemis cotula</i>	Kamitsure-modoki	(+)	A3						—	—	•	•				—
Asteraceae	<i>Artemisia princeps</i>	Yomogi	+	A3						—	—	•	•				—
Asteraceae	<i>Artemisia rubripes</i>	Yabu-yomogi	+	A3						—	—	•	•				—
Asteraceae	<i>Aster novae-angliae</i>	Nebari-nogiku	(+)	A3						—	—	•	•				—
Asteraceae	<i>Cirsium arvense</i>	Seiyo-toge-azami	(+)	A3						—	—	•	•				—
Asteraceae	<i>Conyza sumatrensis</i>	O-arechi-nogiku	(+)	A3						—	—	•	•				—
Asteraceae	<i>Coreopsis lanceolata</i>	O-kinkei-giku	(+)	A3						—	—	•	•				—
Asteraceae	<i>Crepis tectorum</i>	Yaneta-birako	(+)	A3						—	—	(+)	(+)				—
Asteraceae	<i>Erigeron philadelphicus</i>	Haru-joon	(+)	A3						—	—	•	•				—
Asteraceae	<i>Hieracium caespitosum</i>	Kibana-korin-tanpopo	(+)	A2						—	—	•	•				—
Asteraceae	<i>Pilosella brachiata</i>	Yanagi-tanpopo zoku	•	•					●	AL	RA	•	•				—
Asteraceae	<i>Hypochaeris radicata</i>	Butana	(+)	A2						—	—	•	•				—
Asteraceae	<i>Solidago altissima</i>	Seitaka-Awadachi-so	(+)	A2						—	—	•	•				—
Asteraceae	<i>Xanthium occidentale</i>	O-onamomi	(+)	A3						—	—	•	•				—
Boraginaceae	<i>Myosotis arvensis</i>	Nohara-murasaki	(+)	A3						—	—	•	(+)				—
Boraginaceae	<i>Myosotis scorpioides</i>	Wasure-na-gusa	(+)	A3						—	—	•	•				—
Brassicaceae	<i>Alliaria petiolata</i>	Garlic mustard	•	A3						—	—	•	•				—
Brassicaceae	<i>Barbarea vulgaris</i>	Haruzaki-yamagarashi	(+)	A3						—	—	•	•				—
Brassicaceae	<i>Lepidium didymum</i>	Karakusa-garashi	(+)	A3						—	—	•	•				—
Brassicaceae	<i>Nasturtium officinale</i>	Oranda-garashi	(+)	A2						—	—	•	•				—
Brassicaceae	<i>Rorippa sylvestris</i>	Kireha-inu-garashi	(+)	A3						—	—	(+)	•				—
Caryophyllaceae	<i>Silene armeria</i>	Mushitori-nadeshiko	(+)	A3						—	—	(+)	•				—

Family	Scientific names in Japan 1)	JAPANESE NAME	Distribution by literatures 2)											Our result 3)			Period 4)
			Hon.	Hok.	Hab	SHK	KUN	ITU	Ur-At	State	Q-tity	Sakh	Kam	SHK	KUN	ITU	
Convolvulaceae	<i>Cuscuta pentagona</i>	Amerika-nenashi-kazura	(+)	A3						—	—	*	*				—
Cucurbitaceae	<i>Sicyos angulatus</i>	Arechi-uri	(+)	A3						—	—	*	*				—
Fabaceae	<i>Amorpha fruticosa</i>	Itachi-hagi	(+)	A3						—	—	*	*				—
Fabaceae	<i>Cytisus scoparius</i>	Enishida	(+)	A3						—	—	*	*				—
Fabaceae	<i>Lespedeza cyrtobotrya</i>	Maruba-hagi	+	A3						—	—	*	*				—
Fabaceae	<i>Lotus corniculatus ssp. corniculatus</i>	Seiyo-miyakogusa	(+)	A3						—	—	*	*				—
Fabaceae	<i>Medicago lupulina</i>	Kometsubu-umagoyashi	(+)	A3						—	—	*	*				—
Fabaceae	<i>Medicago sativa</i>	Murasaki-umagoyashi	(+)	A3						—	—	(+)	*				—
Fabaceae	<i>Meililotus officinalis ssp. albus</i>	Shirobana-Shinagawa-hagi	(+)	A3						—	—	(+)	*				—
Fabaceae	<i>Trifolium arvense</i>	Shaguma-hagi	(+)	A3						—	—	(+)	*				—
Fabaceae	<i>Wisteria floribunda</i>	Fuji	+	A3						—	—	*	*				—
Haloragaceae	<i>Myriophyllum aquaticum</i>	O-fusamo	(+)	A3						—	—	*	*				—
Hydrocharitaceae	<i>Elodea nuttallii</i>	Ko-kanadamo	(+)	A3						—	—	*	*				—
Lamiaceae	<i>Lamium purpureum</i>	Hime-odoriko-so	(+)	A3						—	—	*	*				—
Malvaceae	<i>Abutilon theophrasti</i>	Ichibi	(+)	A3						—	—	*	*				—
Nymphaeaceae	<i>Cabomba caroliniana</i>	Hagoromo-mo	(+)	A3						—	—	*	*				—
Oxalidaceae	<i>Oxalis corymbosa</i>	Murasaki-katabami	(+)	A3						—	—	*	*				—
Poaceae	<i>Avena sativa</i>	Makarasu-mugi		B													—
Poaceae	<i>Eragrostis curvula</i>	Shinadare-suzume-gaya	(+)	A3						—	—	*	*				—
Poaceae	<i>Lolium multiflorum</i>	Nezumi-mugi	(+)	A3						—	—	(+)	*				—
Pontederiaceae	<i>Eichhornia crassipes</i>	Hotei-aoi	(+)	A3						—	—	*	*				—
Rosaceae	<i>Rubus allegheniensis</i>	Kuromi-kiichigo	(+)	A3						—	—	*	*				—
Rosaceae	<i>Rubus armeniacus</i>	Seiyo-yabuichigo	(+)	A3						—	—	*	*				—
Rosaceae	<i>Rubus exsul</i>	Ishikari-kiichigo	*	A3						—	—	*	*				—
Salicaceae	<i>Populus alba</i>	Urajiro-hakoyanagi	(+)	A3						—	—	(+)	*				—
Saururaceae	<i>Houttuynia cordata</i>	Dokudami	+	A3						—	—	*	*				—
Scrophulariaceae	<i>Verbascum thapsus</i>	Birodo-mozuika	(+)	A3						—	—	*	*				—
Simaroubaceae	<i>Ailanthus altissima</i>	Niwa-urushi	(+)	A3						—	—	*	*				—
Solanaceae	<i>Datula metel</i>	Chosen-asagao	(+)	A3						—	—	*	*				—
Solanaceae	<i>Datula stramonium var. stramonium</i>	Shirobana Chosen-asagao	(+)	A3						—	—	*	*				—
Solanaceae	<i>Datula stramonium var. tatula</i>	Yoshu-chosen-asagao	(+)	A3						—	—	*	*				—

Remarks:

- 1) Two of the new alien taxa: 18. *Anthoxanthum odoratum* subsp. *glabrescens* and *Elytrigia repens* var. *aristata* are not included in the Table 1, because their distributions may be included in *A. odoratum* and *E. repens* respectively.

Plant name for the plants, which have not been recorded in Honshu and Hokkaido, are given in italic.

- 2) + means native plants, (+) means naturalized plants. * means the locality, where the species in question has not been recorded.

Distributions are checked by the following literatures.

- For the Kuril Islands:

Miyabe, K. 1890. The flora of the Kurile Islands. Memoirs of the Boston Society of Natural History 4: 203-275.

Tatewaki, M. 1957. Geobotanical studies on the Kurile Islands. Acta Horti Gotoburgensis 21: 43-123.

Barkalov, V.Y. 2009. Flora of the Kuril Islands. Dalnauka, Vladivostok.

- For Sakhalin

Smirnov, A.A. 2002. Distribution of Vascular Plants in Sakhalin Island. Sakhalin Science Center, Yuzhno-Sakhalinsk.

- For Kamchatka

Yakubov, V. V. and Chernyagina, O. A. (2004). Catalog of Flora of Kamchatka (Vascular Plants).

- 2), 3) Abbreviations and marks:

Abbreviations: Hon.=Honshu, Hok.=Hokkaido, SHK=Shikotan, KUN=Kunashir, ITU=Iturup, Ur-At= from Urup to Atlasov (Islands between Iturup and Kamchatka), Sakh.=Sakhalin, Kam.=Kamchatka

State: AL=Alien, CU=escaped from cultivation, IN=Introduced, [NA]=naturalized.

Q-tity=quantity, VR=very rare, RA=rare, CR=comparably rare, OF=often, VO= very often.

When the plant is regarded as naturalized plant in Hokkaido, the rank of Blue list of Hokkaido is noted (A2, A3, B).

State and Quantity follow Barkalov (2009).

Marks: Distributions according to: Tatewaki (1957)=○, Barkalov (2009)=●. ◆: confirmed by us (-2012) ★: newly found by us (-2012).

- 4) Estimated introduced period. Ai: in Ainu period; Jp: in Japanese period; Ru: in Russian period; Ne: in the newest period.

" — " indicates that the plant is still out of range of the three islands of our research.

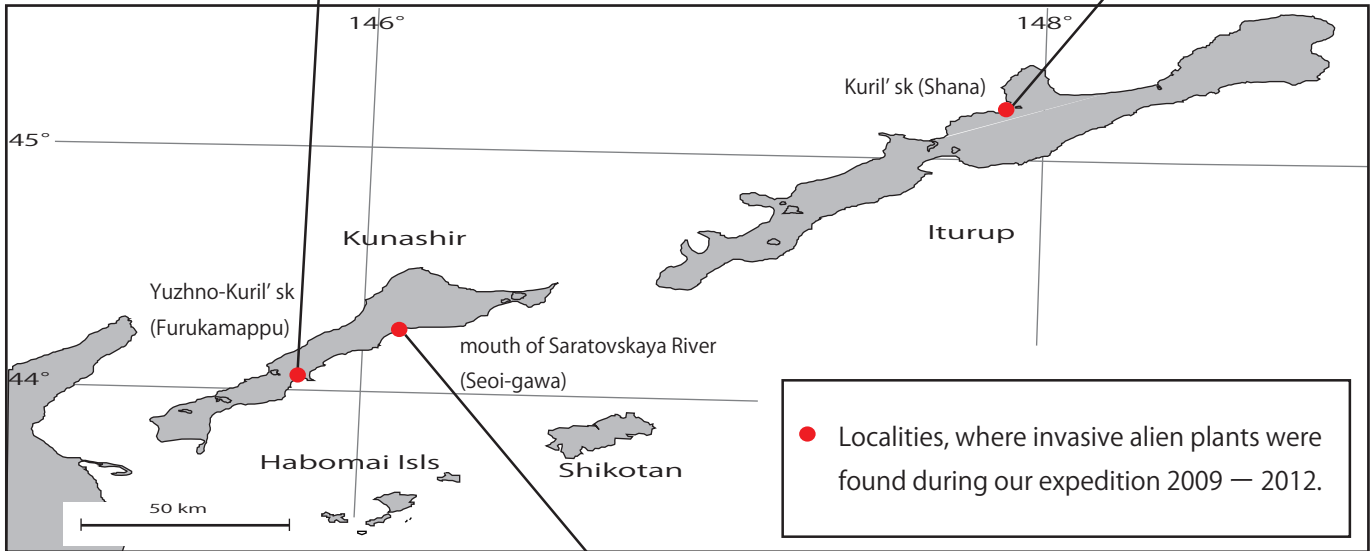
Fig. 2. Invasive alien plants, found during our expedition and thier localities.



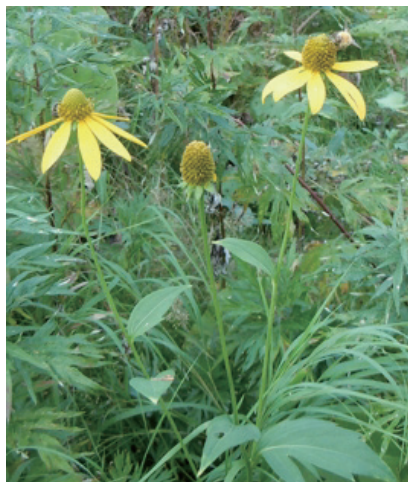
Aegopodium podagraria



Solidago gigantea subsp. *serotina* in Kuril'sk (Shana).



● Localities, where invasive alien plants were found during our expedition 2009 — 2012.



A large colony of *Rudbeckia laciniata*, found along road to the mouth of the river Setatovskaya (Seoi-gawa). Photos by Norihisa Kondo.

Flora List of Stolbovskyy (Shimanobori) Nature Observation Road, Kunashir Island

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Abstract The change of landscapes from evergreen coniferous forest, through mixed forest, to deciduous broadleaf forest was observed along the Stolbovskyy nature observation road on Kunashir Island. The plants growing adjacent to this road were recorded by eye, specimen collection, and taking photographs.

Key words: coniferous forest, deciduous forest, mixed forest, phytogeography

Introduction

The Stolbovskyy nature observation road is located on the Okhotsk Sea-Side of central Kunashir Island (Fig. 1). The nature observation road originated near the center of the Kunashir Island (Figs. 2, 3) and extended northwestward to the coast. The forest landscape along the road changed from evergreen coniferous forest, through mixed forest (Figs. 4, 5), to deciduous broadleaf forest (Fig. 6).

Materials and Methods

The plants growing in the vicinity of the road were recorded by eye, specimen collection, and taking photographs. The surveys were conducted by Y. Kato on August 25, 2012 and by T. Fukuda July 24, 2013. Scientific name was based on Murata and Yonekura (2012). Family name and classification were based on Murata and Yonekura (2013).

Results and Discussions

A list of the flora observed on these surveys is shown in Table 1. Two exotic plants *Pilosella aurantiaca* and *Leucanthemum vulgare* were observed at the entrance of the nature observation road near the center of Kunashir Island. The Russian red list species *Kalopanax septemlobus* var. *septemlobus*, *Taxus cuspidata* and *Magnolia obovata* were identified in the forested areas along the road. Other woody plants observed included *Betula ermanii* var. *ermanii*, *Abies sachalinensis*, *Sorbus commixta* var. *commixta*, *Ulmus laciniata* and *Juglans mandshurica* var. *sachalinensis*. Shrubs and herbaceous plant species were the same as those on Hokkaido Island.

In the coniferous forests, *Clintonia udensis*, *Prunella vulgaris* subsp. *asiatica*, *Chimaphila japonica* were observed, and in the mixed forest and deciduous forests, *Epipactis papillosa* var.

papillosa, *Solidago virgaurea* subsp. *leiocarpa* var. *leiocarpa* f. *japonalpestris*, *Skimmia japonica* var. *intermedia* f. *repens*, *Maianthemum dilatatum*, *Menziesia pentandra*, *Streptopus amplexifolius* var. *papillatus* were observed.

Exotic plants were also observed at the entrance to the nature observation road near the traffic road. However, almost no exotic species were observed in the forested areas along the nature observation road. It was assumed that the nature observation road received very little maintenance because grasses along the side of the road partly covered the road. Although we encountered other people on the nature observation road and saw the soldiers resting at hot springs, the human impact in the area was considered to be relatively low compared to urban areas like Furukamappu (Yuzhno-Kuril'sk) and in cottage areas like Chibukaribetsu (Tret'yakova). Consequently, the number of exotic species observed in the area was very low.

All of collected specimens were deposited at the herbarium of Hokkaido University Museum (SAPS).

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Specimens collected along Stolbovskyy (Shimanobori) nature observation road.

ASTERACEAE

Pilosella aurantiaca (L.) F.Schultz et Sch.Bip. [Kôrin-tanpopo]: Roadside (Entrance of nature observation road)

CYPERACEAE

Carex mollicula Boott. [Hime-shirasuge]: Conifer forest
Carex sachalinensis F.Schmidt var. *sachalinensis* (Sakhalin-itosuge): Conifer forest

ERICACEAE

Chimaphila japonica Miq. [Umegasa-sô]: Mixed forest
Pyrola alpina Andres [Kobano-ithiyakusô]: Mixed forest

POACEAE

Brachypodium sylvatisum (Huds.) P.Beauv. [Yama-kamojigusa]: Deciduous forest
Neomolinia japonica (Franch. et Sav.) Honda [Tatsuno-hige]: Deciduous forest

SAPINDACEAE

Acer ukurunduense Trautv. et C.A.Mey. [Ogara-bana]: Mixed forest

加藤ゆき恵¹, 福田知子²: 2012年・2013年植物調査において国後島中部島登(ストルボフスキー)生態観察路で採集・観察された維管束植物

島登(ストルボフスキー)生態観察路は国後島中部オホーツク海側に位置する, 常緑針葉樹林, 針広混交林, 落葉広葉樹林の林相の変化を観察できる自然歩道である. 樹林帯(常緑針葉樹林, 針広混交林, 落葉広葉樹林)から島登温泉にかけて, 現地で観察できた植物種を記録した.

観察・採集した植物種は, 北海道の樹林帯で普通に見られるものが中心であった. 国後島中央道路に面する生態観察路入り口付近では, コウリンタンポポなどの外来植物種を確認したが, それより奥の観察路では外来種は見られなかった.

(¹ 釧路市立博物館,
² 国立科学博物館植物研究部)

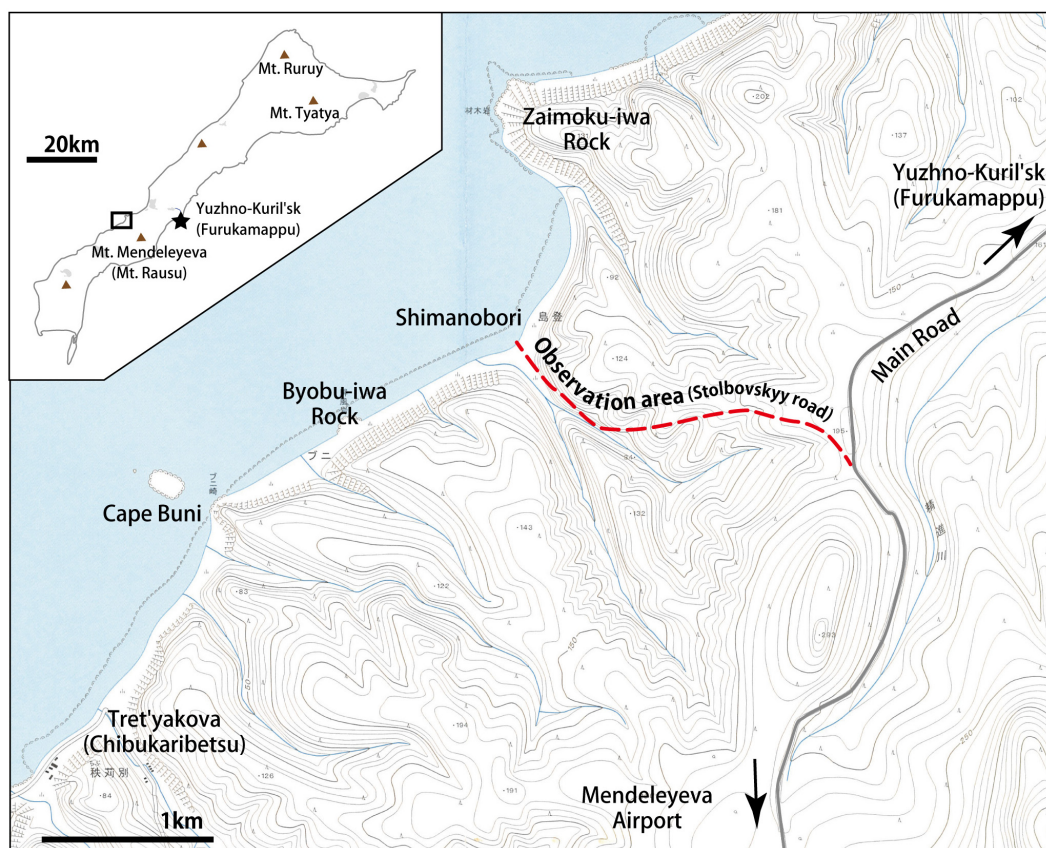


Figure 1.
 Location of Stolbovskyy nature observation road.

Table 1. Plant species of Shimanobori (Stolbovskyy) nature observation road. (Aug. 25, 2012:Kato, Jul. 24, 2013: Fukuda)

Family (APG III)	Scientific name	2012			2013
		Sp.	Ph.	Ob.	Ob.
PTERIDOPHYTA					
Dryopteridaceae	<i>Dryopteris crassirhizoma</i> Nakai				○
Dryopteridaceae	<i>Dryopteris expansa</i> (C.Presl.) Fraser-Jenk. et Jermy				○
GYMNOSPERMAE					
Pinaceae	<i>Abies sachalinensis</i> (F.Schmidt) Mast.		○		○
Pinaceae	<i>Picea jezoensis</i> (Siebold et Zucc.) Carrière		○		○
Taxaceae	<i>Taxus cuspidata</i> Siebold et Zucc.		○		○
ANGIOSPERMAE					
Adoxaceae	<i>Sambucus racemosa</i> L. subsp. <i>kamtschatica</i> (E.L.Wolf) Hultén			○	
Anacardiaceae	<i>Toxicodendron orientale</i> Greene subsp. <i>orientale</i>			○	
Apiaceae (Umbelliferae)	<i>Cryptotaenia canadensis</i> (L.) DC. subsp. <i>japonica</i> (Hassk.) Hand.-Mazz.			○	
Apiaceae (Umbelliferae)	<i>Oenanthe javanica</i> (Blume) DC. var. <i>javanica</i>			○	
Apiaceae (Umbelliferae)	<i>Osmorhiza aristata</i> (Thunb.) Rydb. var. <i>aristata</i>			○	
Aquifoliaceae	<i>Ilex rugosa</i> F.Schmidt var. <i>rugosa</i>			○	○
Araliaceae	<i>Aralia cordata</i> Thunb. var. <i>cordata</i>			○	○
Araliaceae	<i>Kalopanax septemlobus</i> (Thunb.) Koidz. var. <i>septemlobus</i>		○		○
Asparagaceae	<i>Maianthemum dilatatum</i> (A.W.Wood) A.Nelson et J.F.Macbr.			○	
Asparagaceae	<i>Polygonatum odoratum</i> (Mill.) Druce var. <i>maximowiczii</i> (F.Schmidt) Koidz.				○
Asteraceae (Compositae)	<i>Aster glehnii</i> F.Schmidt var. <i>glehnii</i>			○	
Asteraceae (Compositae)	<i>Parasenecio hastatus</i> (L.) H.Koyama subsp. <i>orientalis</i> (Kitam.) H.Koyama var. <i>orientalis</i> (Kitam.) H.Koyama			○	○
Asteraceae (Compositae)	<i>Parasenecio kamtschaticus</i> (Maxim.) Kadota var. <i>kamtschaticus</i>			○	○
Asteraceae (Compositae)	<i>Petasites japonicus</i> (Siebold et Zucc.) Maxim. subsp. <i>giganteus</i> (G.Nicholson) Kitam.			○	○
Asteraceae (Compositae)	<i>Pterocypsela elata</i> (Hemsl.) C.Shih (<i>Lactuca raddeana</i> Maxim. var. <i>elata</i> (Hemsl.) Kitam.)			○	
Asteraceae (Compositae)	<i>Senecio cannabifolius</i> Less.				○
Asteraceae (Compositae)	<i>Solidago virgaurea</i> L. subsp. <i>leiocarpa</i> (Benth.) Hultén var. <i>leiocarpa</i> (Benth.) A.Gray f. <i>japonaplestris</i> Kitam., nom. nud.			○	
Balsaminaceae	<i>Impatiens noli-tangere</i> L.			○	○
Betulaceae	<i>Betula ermanii</i> Cham. var. <i>ermanii</i>		○		○
Betulaceae	<i>Betula platyphylla</i> Sukaczew var. <i>japonica</i> (Miq.) H.Hara				○
Cornaceae	<i>Cornus canadensis</i> L.			○	
Cornaceae	<i>Cornus controversa</i> Hemsl. ex Prain var. <i>controversa</i>			○	
Cyperaceae	<i>Carex mollicula</i> Boott.	○			
Cyperaceae	<i>Carex sachalinensis</i> F.Schmidt var. <i>sachalinensis</i>	○			
Ericaceae	<i>Chimaphila japonica</i> Miq.	○			
Ericaceae	<i>Orthilia secunda</i> (L.) House		○		
Ericaceae	<i>Pyrola alpina</i> Andres	○			
Ericaceae	<i>Rhododendron pentandrum</i> (Maxim.) Graven (<i>Menziesia pentandra</i> Maxim.)			○	
Fagaceae	<i>Quercus crispula</i> Blume var. <i>crispula</i>			○	○
Hydrangeaceae	<i>Hydrangea paniculata</i> Siebold			○	○
Hydrangeaceae	<i>Hydrangea petiolaris</i> Siebold et Zucc.			○	
Hydrangeaceae	<i>Schizophragma hydrangeoides</i> Siebold et Zucc. var. <i>hydrangeoides</i>				○
Juglandaceae	<i>Juglans mandshurica</i> Maxim. var. <i>sachalinensis</i> (Komatsu) Kitam.			○	
Lamiaceae (Labiatae)	<i>Prunella vulgaris</i> L. subsp. <i>asiatica</i> (Nakai) H.Hara			○	
Liliaceae	<i>Clintonia udensis</i> Trautv. et C.A.Mey.		○		○
Liliaceae	<i>Lillium medeoloides</i> A.Gray var. <i>medeoloides</i>			○	○
Liliaceae	<i>Streptopus amplexifolius</i> (L.) DC. var. <i>papillatus</i> Ohwi			○	
Magnoliaceae	<i>Magnolia obovata</i> Thunb.		○		○
Melanthiaceae	<i>Paris verticillata</i> M.Bieb.			○	
Melanthiaceae	<i>Trillium camschatcense</i> Ker Gawl.				○
Melanthiaceae	<i>Veratrum oxysepalum</i> Turcz. var. <i>oxysepalum</i>				○
Onagraceae	<i>Circaea alpina</i> L. subsp. <i>alpina</i>		○		
Orchidaceae	<i>Cephalanthera longibracteata</i> Blume			○	
Orchidaceae	<i>Epipactis papillosa</i> Franch. et Sav. var. <i>papillosa</i>			○	○
Plantaginaceae	<i>Plantago asiatica</i> L.			○	
Poaceae (Gramineae)	<i>Brylkinia caudata</i> (Munro ex A.Gray) F.Schmidt			○	
Poaceae (Gramineae)	<i>Neomolinia japonica</i> (Franch. et Sav.) Honda	○			
Poaceae (Gramineae)	<i>Brachypodium sylvaticum</i> (Huds.) P.Beauv.	○			
Ranunculaceae	<i>Cimicifuga simplex</i> (DC.) Wormsk. ex Turcz.			○	○
Ranunculaceae	<i>Ranunculus silerifolius</i> H.Lév.			○	
Rosaceae	<i>Agrimonia pilosa</i> Ledeb. var. <i>japonica</i> (Miq.) Nakai			○	
Rosaceae	<i>Filipendula camtschatica</i> (Pall.) Maxim.			○	○
Rosaceae	<i>Geum macrophyllum</i> Willd. var. <i>sachalinense</i> (Koidz.) H.Hara			○	
Rosaceae	<i>Padus ssiori</i> (F.Schmidt) C.K.Schneid.				○
Rosaceae	<i>Sorbus commixta</i> Hedl. var. <i>commixta</i>			○	○
Rubiaceae	<i>Galium trifloriforme</i> Kom.			○	
Rutaceae	<i>Skimmia japonica</i> Thunb. var. <i>intermedia</i> Komatsu f. <i>repens</i> (Nakai) Ohwi		○		
Sapindaceae	<i>Acer pictum</i> Thunb.		○		○
Sapindaceae	<i>Acer ukurunduense</i> Trautv. et C.A.Mey.	○	○		○
Saxifragaceae	<i>Saxifraga fusca</i> Maxim. subsp. <i>fusca</i>		○		○
Ulmaceae	<i>Ulmus davidiana</i> Planch. var. <i>japonica</i> (Rehder) Nakai				○
Ulmaceae	<i>Ulmus laciniata</i> (Trautv.) Mayr		○		○
Urticaceae	<i>Urtica playuphylla</i> Wedd.				○

*Sp. = Specimen collected, Ph. = Photographed, Ob.=Observed.

Scientific name was based on Murata and Yonekura. (2012) .

Family name and classification were based on Murata and Yonekura. (2013) .



Figure 2. The entrance of Stolbovskyy nature observation road, near the main road on Kunashir Island.



Figure 4. Mixed forest landscape.



Figure 3. Signboard for the Stolbovskyy nature observation road.



Figure 5. *Taxus cuspidata* in mixed forest.



Figure 6. *Magnolia obovata* in mixed forest.

Recent Condition of the Conservation Status of the Furukamappu Mire (Lake Serebryanoye), Kunashir Island

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Abstract There are several sand dunes in southern part of the Furukamappu Mire (Lake Serebryanoye) and the rare community *Picea glehnii* forests on sand dunes were observed. The plants growing this area were recorded by observation and specimen collection, and we discussed the conservation status of this mire. Construction of an electric pylon caused some damages to the sand dunes, but few exotic species were observed in the area. However, numerous exotic plant species typically associated with urban areas were observed along the road around Furukamappu Pond.

Key words: conservation, Kunashir, *Picea glehnii*, sand dune

Introduction

Furukamappu Mire (Lake Serebryanoye) located northwest of the town Furukamappu (Yuzhno-Kuril'sk) was formed after the sea receded about 3000 year before present (Korotky et al 2000). Among the sand dunes located along the south edge of the mire is a stand of *Picea glehnii*, and the *Picea glehnii* forests on sand dunes were observed in this mire. It was suggested that the *Picea glehnii* forest on sand dunes were very rare community and only founded in Furukamappu and Shunkunitai in Nemuro (Tatewaki and Hirano 1936; Tatewaki 1944).

Materials and Methods

We surveyed these area: 1. sand dunes and neighboring mires, and 2. around Furukamappu Pond (Lake Serebryanoye), on 23 and 26 August, 2012. The plants growing these area were recorded by specimen collection and observation.

Results and Discussions

Examination of aerial photographs and a field surveys by Y.Kato in 2003 revealed that the sand dunes on the edge of the mire were destroyed by the erection of power transmission lines (Figs. 1, 2). However, few exotic species were observed in the affected area in 2012 (Fig. 3).

Ruts considered to have been made by vehicles were discovered along the southern edge of the mire in 2003 (Fig. 4), but the mire vegetation had covered these by 2012. It was proposed that the vehicles responsible for causing the damage were likely involved in building or repairing the electric pylons.

In 2012, flowers of *Nuphar pumila* var. *pumila* and

Sparganium emersum were observed in Furukamappu Pond (Lake Serebryanoye) and *Nymphaea tetragona* was observed to have colonized away from the lake shore. The forest along the edge of the lake was dominated by *Picea glehnii* (Fig. 5).

A field ranger suggested that hunters used the area for leisure activities such as shooting practice, and numerous cartridge cases were found near the pond (Fig. 6). Many exotic plants typical of those found in urban areas were observed along the road to the Furukamappu pond which cut through the mire (Fig. 7). *Eriocaulon atrum* ([Nemuro-Hoshikusa] VU in Japanese Red List) and *Eleocharis acicularis* var. *longiseta* [Matsuba-i] were observed to have colonized puddles on the road (Fig. 8).

It was suggested that the central area of this mire including sand dunes kept relatively good condition. However exotic species invade margin area of the mire, so observation for mire conservation is necessary.

Acknowledgements

We appreciated Antipin, M. A., Bobyr, I.G., Budaev, A., Loguntsev, A. E., and Nevedomskaya, I. A. of the State Natural Reserve "Kuril'sky" for their help in our expedition. We thank to Dr. Hideki Takahashi for providing the opportunity of this survey and Dr. Hiroko Fujita (Botanic Garden, Hokkaido University) for use of photographs in 2003 survey. This study was supported in part by a Grant-in-Aid No. 21405009 to H. Takahashi for Scientific Research (B) from the Japan Society for the Promotion of Science.

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Figure 1. Degraded sand dunes in 2003 (photograph by H.Fujita).



Figure 2. The same degraded sand dunes, shown in Fig.1 in 2012.



Figure 3. Degraded sand dunes colonized by *Cornus canadensis* L.



Figure 4. Vehicle tracks in the mire area in 2003 (photograph by H.Fujita).



Figure 5. Shore of Furukamappu Pond (Lake Serebryanoye).



Figure 6. Dumped drum punctured by shotgun rounds.



Figure 7. Road to the Furukamappu Pond (Serebryanoye Lake).



Figure 8. *Eriocaulon atrum* Nakai [Nemuro-hoshikusa] in the puddles on the road.

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加藤ゆき恵¹, 佐藤広行²: 国後島中部古釜布湿原の近年の状況

国後島中部太平洋側に位置する古釜布湿原は湿原南部に砂丘列があり、砂丘上にアカエゾマツ林が成立している。砂丘上のアカエゾマツ林は古釜布湿原と根室春国岱にのみ見られる希少な群落であるが、鉄塔と送電線の設置により砂丘列の一部が破壊されていた。破壊された砂丘は砂が露出していたものの、外来種の侵入はほとんど見られなかった。湿原北部の古釜布沼にはハンターが入り込み、沼へ至る未舗装の道路沿いに市街地と同じような外来種の侵入が見られた。

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Colonization of Sandy Environment by *Calamagrostis neglecta* (Poaceae) in Serebryanoye Mire, Kunashir Island

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Abstract *Calamagrostis neglecta* (Ehrh.) P. Gaertn., B. Mey. & Schreb. was observed growing on exposed sandy ground in Serebryanoye Mire on Kunashir Island in the southern Kuril Islands in 2012. The observation is noteworthy because *C. neglecta* typically grows in bogs and not in sandy environments. However, the high frequency of fog in the Yuzhno-Kuril'sk area is considered to supply the plant with sufficient water to support growth in sandy environments.

Key words: bog, *Calamagrostis*, Island, Kunashir, mire, Poaceae

Introduction

Calamagrostis neglecta (Ehrh.) P. Gaertn., B. Mey. & Scherb., a member of the family Poaceae, is distributed mainly in the bogs of the tundra regions in the northern hemisphere (Probatova 2003). In Japan, it is distributed mainly in eastern Hokkaido (e.g. Kushiro Mire and Bekanbeushi Mire), in bogs around lakes near Shiretoko, in northern Hokkaido (e.g. Sarobetsu Mire and Uryunuma Mire), and in Ozegahara in Honshu. Many of the bogs in which *C. neglecta* typically grows have a high conservation status in Japan due to their unique biological diversity. *Calamagrostis neglecta* is also distributed on Kunashir Island in the Kuril Islands, and one of the regions where it occurs is Lake Serebryanoye near Yuzhno-Kuril'sk City. Mires extend in the vicinity of Lake Serebryanoye and we have named the mire near the lake, Serebryanoye Mire (Furukamappu-Mire). Although *C. neglecta* is usually associated with bog environments (Osada 1989), the author has confirmed *C. neglecta* growing on sandy ground adjacent to Serebryanoye Mire. This report describes *C. neglecta* in this sandy environment.

Calamagrostis neglecta in Serebryanoye Mire

The author conducted a botanical survey of Serebryanoye Mire on 23 in August 2012. In this study, the name *C. neglecta* was used as *C. inexpansa* is the synonym of *C. neglecta*.

The author found *C. neglecta* growing on sandy ground beneath a power-transmission line in Serebryanoye Mire (Figs. 1, 2). The bog below the line was drained and denuded of vegetation due to construction of the line (Fig. 3). *Rubus phoenicolasius* Maxim., *Artemisia montana* (Nakai) Pamp., and *Maianthemum dilatatum* (A.W. Wood) A. Nelson et J.F. Macbr. were observed growing on the bare ground, but not in the bog (Fig. 4). *Calamagrostis neglecta* typically grows in bogs and it was unusual to find *C. neglecta* growing in sandy ground.

Specific growth environment

Calamagrostis neglecta does not typically grow on dry sandy ground. The surface of the ground was dry and growth conditions appeared unsuitable for this species. A burrow of what appeared to be a small mammal was situated near the observed *C. neglecta* plants (Fig. 5) and inside of the burrow was moist, not so dried. The author wondered where *C. neglecta* obtained sufficient water to survive in such an environment.

Mist occurs frequently near Yuzhno-Kuril'sk, and it is possible that this mist provided enough moisture for *C. neglecta* to grow on sandy soil (Fig. 6). According to Russians who accompanied us, fog occurs frequently on the Pacific Ocean-side of Kunashir, but it is usually fine on the Sea of Okhotsk-side. When we observed the island from a ship, we observed sea fog approaching the island from the Pacific Ocean-side of Kunashir (Fig. 7).

Bogs are oligotrophic wetlands that are not supplied with groundwater, and which remain moist due to water inputs from fog and rain. In this study, the bare sandy ground near the transmission lines was oligotrophic, which is similar to a bog. Sufficient moisture is supplied from the fog which likely infiltrates the bare ground at the site and supports the growth of *C. neglecta* on bare sandy ground.

Acknowledgements

We thank M. A. Antipin, I. G. Bobyr, A. Budaev, A. Loguntsev and I. A. Nevedomskaya of the State Natural Reserve "Kuril'skiy" for their assistance with our expedition. This study was supported in part by a Grant-in-Aid No. 21405009 to H. Takahashi for Scientific Research (B) from the Japan Society for the Promotion of Science.

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佐藤広行：国後島古釜布湿原における砂地に生育するイネ科チシマガリヤスについて

国後島の古釜布湿原において、チシマガリヤスが砂地に生育しているのを確認した。チシマガリヤスは本来高層湿原に生育する植物であり、砂地には生育しない。チシマガリヤスを確認した場所は、本来は高層湿原であったが、送電線の建設のため植生が破壊され裸地になった場所である。砂地表面は乾燥していると思われたが、古釜布地域は霧が多く、チシマガリヤスが生育するのに十分な水分が霧から供給されていることが推察された。

(北海道大学大学院農学院)



Figure 1. Location of the study site in Serebryanoye Mire (Furukamappu Mire) near Serebryanoye Lake supporting stands of *Calamagrostis neglecta*. Bar = 5 km.



Figure 2. *Calamagrostis neglecta* growing on sandy ground.



Figure 3. Power-transmission line in Serebryanoye Mire (Furukamappu Mire).



Figure 4. *Rubus phoenicolasius*, *Artemisia montana*, and *Maianthemum dilatatum* growing together with *C. neglecta* on sandy ground.



Figure 5. Den of a small mammal on bare sandy ground.



Figure 6. Serebryanoye Mire (Furukamappu Mire) covered by fog.



Figure 7. Kunashir Island covered by sea fog.

Plant List of Poaceae Collected on Kunashir and Iturup Islands on a Botanical Expedition in 2012

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Abstract A total of fifty species in the family Poaceae were collected on a botanical expedition to the islands of Kunashir and Iturup in the southern Kurils in 2012. The collected Poaceae specimens were confirmed using Flora of the Kuril Islands (Barkalov 2009) for comparison. As a result, *Sasa nipponica* is considered to be a new record for the Kurils. Two infraspecific taxa, *Anthoxanthum odoratum* var. *alpinum* and *Elytrigia repens* var. *aristata*, are also considered to be new records for the Kurils, and *Lolium perenne*, a naturalized plant, is also new record for the southern Kurils.

Key words: Poaceae, Kunashir, Iturup

Introduction

We conducted a botanical survey of the Kunashir and Iturup islands on August 17 to September 10, 2012. Of the vascular plants independently collected by four Japanese botanists, the members of the Poaceae are summarized here as a preliminary list. The collected Poaceae specimens were compared with those listed in the Flora of the Kuril Islands by Barkalov (2009). Of the Poaceae specimens collected on Kunashir and Iturup islands, a total of 50 species belonging to 30 genera were recorded, and of these, 15 species were confirmed to be naturalized to the islands.

Results and Discussion

Species names generally follow Murata and Yonekura (2012) and are ordered alphabetically in the list. Species names of the naturalized plants are underlined, and taxa that are new records for the Kurils are marked by solid circles (●). Japanese names are given in square brackets. When necessary, taxonomic comments are given as notes below the entry. All plant specimens are deposited in the Herbarium of the Hokkaido University Museum (SAPS).

Plant list of members of the Poaceae in Kunashir and Iturup Islands

Agrostis clavata Trin. [Yama-nukabo]

KUNASHIR:

Chetverikova Cape (Seikarahōru-zaki). Aug. 18, 2012. H. Sato et al. 01520, 01522, 01523 (SAPS042155, 042157, 042158).

Andreyevka (Urarokushibetsu). Aug. 18, 2012. T. Fukuda 2012-76.

Peschanoye Lake (Tōfutsu-ko). Aug. 18, 2012. H. Sato et al. 01593, 01597 (SAPS042228, 042232).

Peschanoye Lake (Tōfutsu-ko). Aug. 19, 2012. H. Sato et al. 01629 (SAPS042389).

Goryacheye Lake (Ichibishinai-ko). Aug. 20, 2012. H. Sato et al. 01824-01827 (SAPS042504-042507); H. Takahashi et al. 35227, 35229.

Veslovskiy Peninsula (Keramui-hantō). Aug. 21, 2012. H. Sato et al. 01547 (SAPS042182).

Legunnoye Lake (Nikishoro-ko). Aug. 22, 2012. H. Sato et al. 01711-01713 (SAPS042471-042473).

Serebryanoye Lake (Furukamappu-numa). Aug. 23, 2012. H. Sato et Y. Kato 01671 (SAPS042431).

Yuzhno-Kuril'sk (Furukamappu). Aug. 24, 2012. H. Sato 01650, 01579 (SAPS042410, 042214).

Goryachiy Plyazh (Seseki), Lesnaya River (Shōjin-gawa). Aug. 24, 2012. H. Sato et Y. Kato 01582 (SAPS042217).

ITURUP:

Dobrynina Bay (Otoimaushi-wan). Aug. 27, 2012. T. Fukuda 2012-369.

Reydovo (Bettobu). Sep. 1, 2012. T. Fukuda 2012-599.

Agrostis flaccida Hack. [Miyama-nukabo]

KUNASHIR:

Stolbchatyy Cape (Zaimoku-iwa). Aug. 22, 2012. H. Takahashi et al. 35306.

ITURUP:

Sopochnoye Lake (Tōro-numa). Aug. 28, 2012. H. Takahashi et T. Fukuda 35525.

Vetrovoy Peresheyek (Rucharu-bara). Aug. 29, 2012. H. Takahashi 35555.

Osennaya River (Oito-gawa). Sep. 4, 2012. H. Takahashi 35632.

Agrostis gigantea Roth. [Konuka-gusa]

KUNASHIR:

Yuzhno-Kuril'sk (Furukamappu). Aug. 18, 2012. T. Fukuda 2012-16.

Andreyevka (Urarokushibetsu). Aug. 18, 2012. H. Sato et al. 01505-01507 (SAPS042140- 042142).

Chetverikova Cape (Seikarahōru-zaki). Aug. 18, 2012. H. Sato et al. 01531, 01532 (SAPS042166, 042167).

Peschanoye Lake (Tōfutsu-ko). Aug. 18, 2012. H. Sato et al. 01598 (SAPS042233).

Peschanoye Lake (Tōfutsu-ko). Aug. 19, 2012. H. Sato et al. 01718, 01719 (SAPS042478, 042479).

Goryacheye Lake (Ichibishinai-ko). Aug. 20, 2012. Y. Kato 127, 132.

Veslovskiy Peninsula (Keramui-hantō). Aug. 21, 2012. H. Takahashi et al. 35271.

Aliger Lake (Arigeru-ko). Aug. 22, 2012. H. Sato et al. 01709, 01710 (SAPS042469, 042470).

Serebryanoye Lake (Furukamappu-numa). Aug. 23, 2012. H. Sato et Y. Kato 01652, 01668-01670 (SAPS042412, 042428-042430); Y. Kato 262.

ITURUP:

Kuril'sk (Shana). Aug. 25, 2012. T. Fukuda 2012-326, 327.

Dobrynina Bay (Otoimaushi). Aug. 27, 2012. H. Takahashi et T. Fukuda 35391.

Sopochnoye Lake (Tōro-numa). Aug. 28, 2012. H. Takahashi et T. Fukuda 35425, 35458; T. Fukuda 2012-517.

Kuril'sk (Shana). Sep. 1, 2012. T. Fukuda 2012-592.

Agrostis scabra Willd. [Ezo-nukabo]

KUNASHIR:

Peschanoye Lake (Tōfutsu-ko). Aug. 19, 2012. H. Sato et al. 01720-01723 (SAPS042480-042483); H. Takahashi et al. 35152.

Goryacheye Lake (Ichibishinai-ko). Aug. 20, 2012. H. Sato et al. 01741-01743 (SAPS042501-042503); Y. Kato 128.

Legunnoye Lake (Nikishoro-ko). Aug. 22, 2012. H. Sato et al. 01704, 01705 (SAPS042464, 042465).

Goryachiy Plyazh (Seseki), Lesnaya River (Shōjin-gawa). Aug. 24, 2012. H. Sato et Y. Kato 01654-01656 (SAPS042414-042416).

ITURUP:

Reydovo (Bettobu). Sep. 1, 2012. T. Fukuda 2012-704.

Anthoxanthum nitens (Weber) Y.Schouten et Veldkamp var. **sachalinensis** (Printz) Yonek. [Kōbō]

Hierochloe sachalinensis (Printz.) Worosch. —Barkalov, Fl. Kur. Isl. 316 (2009).

ITURUP:

Sof'a Bay (Sokiya-wan) Aug. 26, 2012. H. Takahashi et T. Fukuda 35351.

Tornaya Bay (Tōro-wan) Aug. 28, 2012. H. Takahashi et T. Fukuda 35534.

Vetrovoy Peresheyek (Rucharu-bara). Aug. 29, 2012. H. Takahashi 35543.

Osenny and Pioner (Oito, Rubetsu). Sep. 4, 2012. T. Fukuda 2012-655; H. Takahashi 35650.

Osennaya River (Oito-gawa). Sep. 4, 2012. H. Takahashi 35618.

● **Anthoxanthum odoratum** L. subsp. **glabrescens** (Čelak.) Asch. et Graebn. [Kenashi-Harugaya]

KUNASHIR:

Andreyevka (Urarokushibetsu). Aug. 18, 2012. H. Sato et al. 01524 (SAPS042161); T. Fukuda 2012-62.

Yuzhno-Kuril'sk (Furukamappu). Aug. 24, 2012. H. Sato 01580 (SAPS042215).

ITURUP:

Reydovo (Bettobu). Sep. 1, 2012. T. Fukuda 2012-603b.

Anthoxanthum odoratum L. subsp. **odoratum** [Haru-gaya]

KUNASHIR:

Andreyevka (Urarokushibetsu). Aug. 18, 2012. Y. Kato 031.

Goryachiy Plyazh (Seseki), Lesnaya River (Shōjin-gawa). Aug. 24, 2012. H. Sato et Y. Kato 01581 (SAPS042216).

Avena fatua L. [Karasu-mugi]

KUNASHIR:

Andreyevka (Urarokushibetsu). Aug. 18, 2012. H. Sato et al. 01601, 01833 (SAPS042236, 042513).

Avenella flexuosa (L.) Drejer [Kome-susuki]

KUNASHIR:

Goryacheye Lake (Ichibishinai-ko). Aug. 20, 2012. H. Sato et al. 01739, 01740 (SAPS042499, 0424500).

ITURUP:

Sopochnoye Lake (Tōro-numa). Aug. 28, 2012. H. Takahashi et T. Fukuda 35535.

Beckmannia syzigachne (Steud.) Fernald [Kazunoko-gusa]

KUNASHIR:

Serebryanoye Lake (Furukamappu-numa). Aug. 23, 2012. H. Sato et Y. Kato 01570, 01603 (SAPS042205, 042238); Y. Kato 260.

Brachypodium sylvaticum (Huds.) P.Beauv. [Yama-kamoji-gusa]

Brachypodium kurilense (Probat.) Probat. in Pl. Vosc. Orient. Ex. Sov. 1:109 (1985) — Barkalov, Fl. Kur. Isl. 310 (2009).

KUNASHIR:

Andreyevka (Urarokushibetsu). Aug. 18, 2012. H. Sato et al. 01510-01511, 01519 (SAPS042145-042146, 042154).

Goryacheye Lake (Ichibishinai-ko). Aug. 20, 2012. H. Sato et al. 01828 (SAPS042508); Y. Kato 343.

Serebryanoye Lake (Furukamappu-numa). Aug. 23, 2012. H. Sato et Y. Kato 01617, 01618 (SAPS042377, 042378); Y. Kato 261.

Tret'yakovo Forest (Chibukaribetsu) Aug. 25, 2012. Y. Kato 303.

Bromus inermis Leyss. [Ko-suzumeno-chahiki]

Bromopsis inermis (Leyss.) Holub — Barkalov, Fl. Kur. Isl. 310 (2009).

KUNASHIR:

Yuzhno-Kuril'sk (Furukamappu). Aug. 24, 2012. H. Sato 01646-

01648 (SAPS042406-042408).

ITURUP:

Kuril'sk (Shana). Aug. 25, 2012. T. Fukuda 2012-311.

Brylkinia caudata (Munro ex A.Gray) F.Schmidt [Hogaeri-gaya]

Brylkinia caudata (Munro) F. Schmidt — Barkalov, Fl. Kur. Isl. 311 (2009).

KUNASHIR:

Chetverikova road side (Seikarahōru). Aug. 24, 2012. H. Sato et al. Y. Kato 01628 (SAPS042388); Y. Kato 178.

Calamagrostis epigeios (L.) Roth [Yama-awa]

KUNASHIR:

Peschanoye Lake (Tōfutsu-ko). Aug. 19, 2012. H. Sato et al. 01659-01661, 01731 (SAPS042419-042421, 042491).

Veslovskiy Peninsula (Keramui-hantō). Aug. 21, 2012. H. Sato et al. 01554-01557 (SAPS042189-042192); T. Fukuda 2012-236; T. Fukuda 2012-236; H. Takahashi et al. 35255, 35264.

Aliger Lake (Arigeru-ko). Aug. 21, 2012. Y. Kato 202.

Note: This species was previously recorded as *Calamagrostis extremiorientalis* (Tzvel.) Probat. (Barkalov 2009); however, the first author considers that *C. extremiorientalis* is synonymous with *C. epigeios*.

Calamagrostis hakonensis Franch. et Sav. [Hime-nogariyasu]

KUNASHIR:

Goryachiy Plyazh (Seseki), Lesnaya River (Shōjin-gawa). Aug. 24, 2012. H. Sato et al. Y. Kato 01632-01636, 01640 (SAPS042392-042396, 042400).

ITURUP:

Sof'a Bay (Sokiya). Aug. 26, 2012. H. Takahashi et al. T. Fukuda 35358.

Foot of Mt. Baranskogo (Sashiusu-yama). Sep. 5, 2012. H. Takahashi 35696.

Calamagrostis neglecta (Ehrh.) P.Gaertn., B.Mey. et Scherb. [Chishima-gariyasu]

KUNASHIR:

Andreyevka (Urarokushibetsu). Aug. 18, 2012. Y. Kato 010.

Peschanoye Lake (Tōfutsu-ko). Aug. 18, 2012. H. Sato et al. 01657, 01658, 01664, 01674-01679 (SAPS042417, 042418, 042424, 042434-042439).

Peschanoye Lake (Tōfutsu-ko). Aug. 19, 2012. T. Fukuda 2012-262; H. Takahashi et al. 35103, 35182

Veslovskiy Peninsula (Keramui-hantō). Aug. 21, 2012. H. Sato et al. 01540-01544 (SAPS042175-042179).

Aliger Lake (Arigeru-ko). Aug. 21, 2012. Y. Kato 203.

Note: In the Kuril Islands, this species was recorded as *Calamagrostis inexpansa* A. Gray (Probatova 2003, Barkalov 2009). Murata and Yonekura (2012) adopted the scientific name *C. stricta* (Timm) Koeler subsp. *inexpansa* (A. Gray) C.W. Greene for this species in Japan. However, based on field observations and a herbarium study, the first author considers that *C. inexpansa* is synonymous with *C. neglecta*. A comparative study with European *C. stricta* is considered necessary.

Calamagrostis purpurea (Trin.) Trin. [Iwa-nogariyasu]

KUNASHIR:

Chetverikova Cape (Seikarahōru-zaki). Aug. 18, 2012. H. Sato et al. 01515-01518, 01527-01529 (SAPS042150-042153, 042162-042164).

Peschanoye Lake (Tōfutsu-ko). Aug. 18, 2012. H. Sato et al. 01662, 01663, 01680-01682, 01685-01688 (SAPS042422, 042423, 042440-042442, 042445-042448); Y. Kato 046.

Peschanoye Lake (Tōfutsu-ko). Aug. 19, 2012. H. Sato et al. 01732-01734, 01736, 01737 (SAPS042492-042494, 042496, 042497); T. Fukuda 2012-261.

Goryacheye Lake (Ichibishinai-ko). Aug. 20, 2012. H. Sato et al. 01683, 01684 (SAPS042443, 042444).

Veslovskiy Peninsula (Keramui-hantō). Aug. 21, 2012. H. Sato et al. 01551-01553 (SAPS042186-042188).

Serebryanoye Lake (Furukamappu-numa). Aug. 23, 2012. H. Sato et al. Y. Kato 01565, 01566 (SAPS042200, 042201); Y. Kato 218, 219.

Goryachiy Plyazh (Seseki), Lesnaya River (Shōjin-gawa). Aug. 24, 2012. H. Sato et al. Y. Kato 01637-01639, 01665-01667 (SAPS042397-042399, 042425-042427).

ITURUP:

Sof'a Bay (Sokiya). Aug. 26, 2012. T. Fukuda 2012-354.

Dobrynina Bay (Otoimaushi-wan). Aug. 27, 2012. T. Fukuda 2012-397.

Senokosnaya Bay (Shimonaibo-gyojō). Aug. 27, 2012. T. Fukuda 2012-428; H. Takahashi et al. T. Fukuda 35383, 35416.

Sopochnoye Lake (Tōro-numa). Aug. 28, 2012. T. Fukuda 2012-475; H. Takahashi et al. T. Fukuda 35452, 35455.

Vetrovoy Peresheyek (Rucharu-bara). Aug. 29, 2012. H. Takahashi 35544.

Reydovo (Bettobu). Sep. 1, 2012. T. Fukuda 2012-703.

Osennaya River (Oito-gawa). Sep. 4, 2012. H. Takahashi 35627.

Foot of Mt. Baranskogo (Sashiusu-yama). Sep. 5, 2012. H. Takahashi 35677.

Note: In the Kuril Islands, this species was recorded as *Calamagrostis angustifolia* Kom., *C. barbata* V. Vassil., and *C. langsдорffii* (Link) Trin. (Probatova 2003, Barkalov 2009). Murata and Yonekura (2012) adopted the scientific name *C. purpurea* (Trin.) Trin. subsp. *langsдорffii* (Link) Tzvelev for this species in Japan. There could be some species within this 'broad' species, but at present, the first author treated it as *C. purpurea* sensu lato. The possibility of this being a 'broad' species, i.e., a *C. purpurea* complex, will be examined in the future.

Calamagrostis sachalinensis F.Schmidt [Takane-nogariyasu]

KUNASHIR:

Andreyevka (Urarokushibetsu). Aug. 18, 2012. H. Sato et al. 01689-01698 (SAPS042449-042458).

Goryacheye Lake (Ichibishinai-ko). Aug. 20, 2012. H. Sato et al. 01830 (SAPS042510).

Serebryanoye Lake (Furukamappu-numa). Aug. 23, 2012. H. Sato et al. Y. Kato 01567, 01568 (SAPS042202, 042203).

Dactylis glomerata L. [Kamo-gaya]

KUNASHIR:

Chetverikova Cape (Seikarahōru-zaki). Aug. 18, 2012. H. Sato et al. 01534, 01535 (SAPS042169, 042170).

Yuzhno-Kuril'sk (Furukamappu). Aug. 24, 2012. H. Sato 01672, 01673 (SAPS042432, 042433)

Deschampsia beringensis Hultén [Hirohano-komesusuki s. l.]

ITURUP:

Osenaya River (Oito-gawa). Sep. 4, 2012. H. Takahashi 35628.

Kasatka Bay (Hitokappu-wan). Sep. 2, 2012. H. Takahashi 35604, 35605.

Note: *Deschampsia beringensis* and *D. macrothyrsa* (Tatew. et Ohwi) Kawano were recorded from Kunashir and Iturup Islands (Probatova 2003). However, since the first author considers *D. macrothyrsa* and *D. beringensis* to be synonyms, the name *D. beringensis* is adopted here as *D. macrothyrsa* is the synonym.

Echinochloa crus-galli (L.) P.Beauv. [Inu-bie]

KUNASHIR:

Stolbovskyy Hotspring (Shimanobori-onsen). Aug. 25, 2012. Y. Kato 302.

Elymus dahuricus Turcz. ex Griseb. [Hama-mugi]

KUNASHIR:

Chetverikova Cape (Seikarahōru-zaki). Aug. 18, 2012. H. Sato et al. 01533 (SAPS042168); H. Takahashi et al. 35028

Peschanoye Lake (Tōfutsu-ko). Aug. 18, 2012. H. Sato et al. 01610, 01611 (SAPS042245, 042246).

Veslovskiy Peninsula (Keramui-hantō). Aug. 21, 2012. H. Sato et al. 01537-01539 (SAPS042172-042174); Y. Kato 147.

Serebryanoye Lake (Furukamappu-numa). Aug. 23, 2012. H. Sato et Y. Kato 01615, 01616 (SAPS042250, 042251); Y. Kato 263.

ITURUP:

Dobrynin Bay (Otoimaushi). Aug. 27, 2012. H. Takahashi et T. Fukuda 35374, 35402.

● *Elytrigia repens* (L.) Desv. ex B.D.Jackson var. *aristata* (Doell) Prokud. [Noge-shiba-mugi]

KUNASHIR:

Serebryanoye Lake (Furukamappu-numa). Aug. 23, 2012. H. Sato et Y. Kato 01605-01608 (SAPS042240-042243).

ITURUP:

Reydovo (Bettobu). Sep. 1, 2012. T. Fukuda 2012-603a.

Note: *Elytrigia repens* var. *aristata* can be distinguished from *E. repens* var. *repens* by the presence of long awns. This infraspecific taxon is included in *E. repens* by Russian botanists, but this is the first record of this variety in the southern Kurils, and we therefore consider it to be a recent invader in the southern Kurils.

Elytrigia repens (L.) Desv. ex B.D.Jackson var. *repens* [Shiba-mugi]

Elytrigia repens (L.) Nevski —Barkalov, Fl. Kur. Isl. 316 (2009).

ITURUP:

Kuril'sk (Shana). Aug. 26, 2012. T. Fukuda 2012-341.

Kuril'sk (Shana). Sep. 1, 2012. T. Fukuda 2012-595.

Festuca ovina L. [Ushinoke-gusa]

KUNASHIR:

Peschanoye Lake (Tōfutsu-ko). Aug. 19, 2012. H. Sato et al. 01738 (SAPS042498).

Veslovskiy Peninsula (Keramui-hantō). Aug. 21, 2012. H. Sato et al. 01546 (SAPS 042181); Y. Kato 145.

Stolbchatyy Cape (Zaimokuiwa). Aug. 22, 2012. T. Fukuda 2012-281.

Festuca ovina L. subsp. *ruprechtii* (Boiss.) Tzvelev [Miyama-ushinoke-gusa]

KUNASHIR:

Stolbchatyy Cape (Yaitaikotan sea-side, Zaimoku-iwa). Aug. 22, 2012. H. Sato et al. 01703 (SAPS042463).

Festuca rubra L. [Ō-ushinoke-gusa]

KUNASHIR:

Peschanoye Lake (Tōfutsu-ko). Aug. 18, 2012. H. Sato et al. 01609 (SAPS042244).

Serebryanoye Lake (Furukamappu-numa). Aug. 23, 2012. H. Sato et Y. Kato 01613, 01614 (SAPS042248, 042249).

ITURUP:

Dobrynin Bay (Otoimaushi). Aug. 27, 2012. T. Fukuda 2012-398a; H. Takahashi 35392, 35397.

Glyceria alnasteretum Kom. [Miyama-dojyō-tsunagi]

KUNASHIR:

Peschanoye Lake (Tōfutsu-ko). Aug. 19, 2012. H. Sato et al. 01630, 01631 (SAPS042390, 042391).

Holcus lanatus L. [Shirage-gaya]

KUNASHIR:

Yuzhno-Kuril'sk (Furukamappu). Aug. 24, 2012. H. Sato 01576, 01577 (SAPS042211, 042212).

Leymus mollis (Trin. ex Spreng.) Pilg. [Hama-nin'niku]

Leymus mollis (Trin.) Pilger —Barkalov, Fl. Kur. Isl. 316 (2009).

KUNASHIR:

Yuzhno-Kuril'sk (Furukamappu). Aug. 18, 2012. T. Fukuda 2012-13.

Peschanoye Lake (Tōfutsu-ko). Aug. 18, 2012. H. Sato et al. 01602 (SAPS042237).

Veslovskiy Peninsula (Keramui-hantō), Aug. 21, 2012. H. Sato et al. 01831, 01832 (SAPS042511, 042512); T. Fukuda 2012-240.

● *Lolium perenne* L. [Hoso-mugi]

ITURUP:

Kuril'sk (Shana). Sep. 1, 2012. T. Fukuda 2012-574.

Note: Barkalov (2009) recorded this species in Paramushir in the northern Kurils, but not in the southern Kurils. We consider it to be a recent invader in the southern Kurils.

Miscanthus sinensis Andersson [Susuki]

KUNASHIR:

- Goryacheye Lake (Ichibishinai-ko). Aug. 20, 2012. H. Sato et al. 01829 (SAPS042509); H. Takahashi et al. 35213.
- Goryachiy Plyazh (Seseki), Lesnaya River (Shōjin-gawa). Aug. 24, 2012. H. Sato et Y. Kato 01627 (SAPS042387).
- ITURUP:
- Foot of Mt. Baranskogo (Sashiusu-yama). Sep. 5, 2012. H. Takahashi 35682.
- Moliniopsis japonica* (Hack.) Hayata [Numa-gaya]**
- KUNASHIR:
- Peschanoye Lake (Tōfutsu-ko). Aug. 19, 2012. H. Sato et al. 01625, 01626 (SAPS042385, 042386).
- Neomolinia japonica* (Franch. et Sav.) Honda [Tatsuno-hige]**
- Neomolinia japonica* (Franch. et Savat.) Probat. —Barkalov, Fl. Kur. Isl. 316 (2009).
- KUNASHIR:
- Tret'yakovo Forest (Chibukaribetsu) Aug. 25, 2012. Y. Kato 315.
- Phalaris arundinacea* L. [Kusa-yoshi]**
- Phalaroides arundinacea* (L.) Rausch. —Barkalov, Fl. Kur. Isl. 316 (2009).
- KUNASHIR:
- Peschanoye Lake (Tōfutsu-ko). Aug. 19, 2012. H. Sato et al. 01623, 01624 (SAPS042383, 042384).
- ITURUP:
- Sof'a Bay (Sokiya). Aug. 26, 2012. H. Takahashi et T. Fukuda 35356.
- Dobrynina Bay (Otoimaushi-wan). Aug. 27, 2012. T. Fukuda 2012-358.
- Sopochnoye Lake (Tōro-numa). Aug. 28, 2012. T. Fukuda 2012-504; H. Takahashi et T. Fukuda 35457.
- Phleum pratense* L. [Ō-awagaeri]**
- KUNASHIR:
- Andreyevka (Urarokushibetsu). Aug. 18, 2012. Y. Kato 011.
- Chetverikova Cape (Seikarahōru-zaki). Aug. 18, 2012. H. Sato et al. 01530 (SAPS042165); H. Takahashi et al. 35004.
- Peschanoye Lake (Tōfutsu-ko). Aug. 18, 2012. H. Sato et al. 01590, 01612 (SAPS042225, 042247); Y. Kato 048.
- Peschanoye Lake (Tōfutsu-ko). Aug. 19, 2012. H. Sato et al. 01622 (SAPS042382).
- Around Golvnino (Tomari). Aug. 21, 2012. H. Takahashi et al. 35268.
- Veslovskiy Peninsula (Keramui-hantō). Aug. 21, 2012. H. Sato et al. 01548 (SAPS042183); H. Takahashi et al. 35245.
- ITURUP:
- Sof'a Bay (Sokiya). Aug. 26, 2012. H. Takahashi et T. Fukuda 35352.
- Sopochnoye Lake (Tōro-numa). Aug. 28, 2012. H. Takahashi et T. Fukuda 35464.
- Vetrovoy Peresheyek (Rucharu-bara). Aug. 29, 2012. H. Takahashi 35548.
- Reydovo (Bettobu). Sep. 1, 2012. T. Fukuda 2012-612.
- Phragmites australis* (Cav.) Trin. ex Steud. [Yoshi]**
- KUNASHIR:
- Peschanoye Lake (Tōfutsu-ko). Aug. 18, 2012. H. Takahashi et al. 35097.
- Peschanoye Lake (Tōfutsu-ko). Aug. 19, 2012. H. Sato et al. 01620 (SAPS042380).
- ITURUP:
- Dobrynina Bay (Otoimaushi). Aug. 27, 2012. H. Takahashi et T. Fukuda 35399.
- Poa annua* L. [Suzumeno-katabira]**
- KUNASHIR:
- Yuzhno-Kuril'sk (Furukamappu). Aug. 18, 2012. T. Fukuda 2012-13.
- Chetverikova Cape (Seikarahōru-zaki). Aug. 18, 2012. H. Sato et al. 01521 (SAPS042156).
- Golvnino (Tomari). Aug. 21, 2012. H. Takahashi et al. 35238.
- Stolbchatyy Cape (Yaitaikotan sea-side, Zaimoku-iwa). Aug. 22, 2012. H. Sato et al. 01702 (SAPS042462).
- Serebryanoye Lake (Furukamappu-numa). Aug. 23, 2012. H. Sato et Y. Kato 01604 (SAPS042239).
- ITURUP:
- Dobrynina Bay (Otoimaushi). Aug. 27, 2012. H. Takahashi et T. Fukuda 35377.
- Poa compressa* L. [Ko-ichigo-tsunagi]**
- ITURUP:
- Kuibyshevskoye Lake (Rausu-numa). Aug. 30, 2012. T. Fukuda 2012-567b.
- Poa macrocalyx* Trautv. et C.A.Mey. [Karafuto-ichigo-tsunagi]**
- KUNASHIR:
- Peschanoye Lake (Tōfutsu-ko). Aug. 19, 2012. H. Sato et al. 01729, 01730 (SAPS042489, 042490); H. Takahashi 35133.
- Stolbchatyy Cape (Zaimoku-iwa). Aug. 22, 2012. H. Takahashi et al. 35302.
- Legunnoye Lake (Nikishoro-ko). Aug. 22, 2012. H. Sato et al. 01706 (SAPS042466).
- ITURUP:
- Dobrynina Bay (Otoimaushi-wan). Aug. 27, 2012. T. Fukuda 2012-371, 398b, 399; H. Takahashi 35372.
- Senokosnaya Bay (Shimonaibo-gyojō). Aug. 27, 2012. T. Fukuda 2012-411; H. Takahashi 35412.
- Vetrovoy Peresheyek (Rucharu-bara). Aug. 29, 2012. H. Takahashi and 35539.
- Poa palustris* L. [Numa-ichigo-tsunagi]**
- KUNASHIR:
- Peschanoye Lake (Tōfutsu-ko). Aug. 19, 2012. H. Sato et al. 01727, 01728 (SAPS042487, 042488).
- Serebryanoye Lake (Furukamappu-numa). Aug. 23, 2012. H. Sato et Y. Kato 01571 (SAPS042206).
- ITURUP:
- Dobrynina Bay (Otoimaushi-wan). Aug. 27, 2012. T. Fukuda 2012-395, 396.

***Poa pratensis* L. [Nagaha-gusa]**

KUNASHIR:

Yuzhno-Kuril'sk (Furukamappu). Aug. 18, 2012. T. Fukuda 2012-25, 26.

ITURUP:

Kuril'sk (Shana). Aug. 25, 2012. T. Fukuda 2012-323.

Kuril'sk (Shana). Aug. 26, 2012. T. Fukuda 2012-341.

Dobrynina Bay (Otoimaushi). Aug. 27, 2012. H. Takahashi et T. Fukuda 35367.

Sopochnoye Lake (Tōro-numa). Aug. 28, 2012. T. Fukuda 2012-517; H. Takahashi et T. Fukuda 35424, 35449.

Vetrovoy Peresheyek (Rucharu-bara). Aug. 29, 2012. H. Takahashi and T. Fukuda 35542, 35552.

Reydovo (Bettobu). Sep. 1, 2012. T. Fukuda 2012-612.

***Poa trivialis* L. [Ō-suzumeno-katabira]**

KUNASHIR:

Veslovskiy Peninsula (Keramui-hantō). Aug. 21, 2012. H. Sato et al. 01549, 01550 (SAPS042184, 042185).

Serebryanoye Lake (Furukamappu-numa). Aug. 23, 2012. H. Sato et Y. Kato 01572 (SAPS042207).

***Puccinellia kurilensis* (Takeda) Honda [Chishima-dojyōtsunagi]**

KUNASHIR:

Veslovskiy Peninsula (Keramui-hantō). Aug. 21, 2012. H. Sato et al. 01562-01564, 01619, 01699, 01700 (SAPS042197-042199, 042379, 042459, 042460).

Serebryanoye Lake (Furukamappu-numa). Aug. 23, 2012. Y. Kato 264.

***Sasa kurilensis* (Rupr.) Makino et Shibata [Chishima-zasa]**

KUNASHIR:

Goryachiy Plyazh (Seseki), Lesnaya River (Shōjin-gawa). Aug. 24, 2012. H. Sato et Y. Kato 01641 (SAPS042401).

ITURUP:

Sopochnoye Lake (Tōro-numa). Aug. 28, 2012. H. Takahashi et T. Fukuda 35445.

***Sasa nipponica* (Makino) Makino et Shibata [Miyako-zasa]**

KUNASHIR:

Andreyevka (Urarokushibetsu). Aug. 18, 2012. H. Sato et al. 01512, 01513 (SAPS042147, 042148).

Note: *Sasa nipponica* (Makino) Makino et Shibata is a new record for the Kuril Islands. Barkalov (2009) recorded *Sasa sendaica*, which belongs to the same section as *S. nipponica*, in the Kuril Islands. *Sasa nipponica* can clearly be distinguished from *Sasa sendaica* by having glabrous culm sheaths.

***Sasa senanensis* (Franch. et Sav.) Rehder [Kumai-zasa]**

KUNASHIR:

Chetverikova Cape (Seikarahōru-zaki). Aug. 18, 2012. H. Sato et al. 01526, 01645 (SAPS042161, 042405).

Goryacheye Lake (Ichibishinai-ko). Aug. 20, 2012. H. Sato et al. 01643, 01644 (SAPS042403, 042404).

Goryachiy Plyazh (Seseki), Lesnaya River (Shōjin-gawa). Aug. 24, 2012. H. Sato et Y. Kato 01642 (SAPS042402).

***Sasa spiculosa* (F.Schmidt) Makino [Okuyama-zasa]**

KUNASHIR:

Goryacheye Lake (Ichibishinai-ko). Aug. 20, 2012. H. Takahashi et al. 35196.

***Schedonorus pratensis* (Huds.) P.Beauv. [Hiroha-ushinoke-gusa]**

KUNASHIR:

Chetverikova Cape (Seikarahōru-zaki). Aug. 18, 2012. H. Sato et al. 01503, 01504 (SAPS042138, 042139).

Yuzhno-Kuril'sk (Furukamappu). Aug. 24, 2012. H. Sato 01578 (SAPS042213).

ITURUP:

Reydovo (Bettobu). Sep. 1, 2012. T. Fukuda 2012-604.

***Trisetum sibiricum* Rupr. [Chishima-kanitsuri]**

KUNASHIR:

Veslovskiy Peninsula (Keramui-hantō). Aug. 21, 2012. H. Sato et al. 01558-01561 (SAPS042193-042196).

Veslovskoe Lake (Keramui-ko). Aug. 21, 2012. H. Takahashi et al. 35251.

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佐藤広行¹, 加藤ゆき恵², 福田知子³, 高橋英樹⁴: 2012 年野外調査において国後島と択捉島で採集されたイネ科植物リスト

2012 年の野外調査において、国後島と択捉島で 50 種のイネ科植物を採集し、その植物相を Flora of the Kuril Islands (Barkalov 2009) と比較した。その結果、ミヤコザサが千島列島では初記録であった。また、ケナシハルガヤ、ノゲシバムギが千島列島では種内分類群として初記録となる。また、帰化植物であるホソムギは南千島では初記録となる。

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Aquatic Plants Collected in Kunashir and Iturup Islands, in 2012

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Abstract A list of 37 species in 16 families of aquatic plants was prepared based on a field trip to Kunashir and Iturup Islands in 2012. Common aquatic plants in the islands of Kunashir and Iturup are *Potamogeton perfoliatus*, *P. praelongus*, *Persicaria amphibia* and *Hippuris vulgaris*. We recorded eight species of *Potamogeton*. The temperate family Hydrocharitaceae and the genus *Trapa* were not found.

Key words: aquatic plants, Kunashir, Iturup

Introduction

Despite the numerous freshwater and brackish lakes, ponds, rivers and wetlands on the Kuril Islands, the total number of aquatic plant species is relatively low, approximately half belong to the genus *Potamogeton* (Miki 1934; Tatewaki 1939). Interestingly, the family Hydrocharitaceae, which is widely distributed from Honshu to Hokkaido in Japan, is not represented in the Kurils (Tatewaki 1934, 1939). The only studies specifically on the aquatic plants of Kurils was reported by Miki in 1933 and 1934. Recently, there have been few reports of aquatic plants in the northern Kurils (Takahashi and Kuwahara 1998; Takahashi et al. 1998). Barkalov (2009) summarized the total flora and vegetation of the Kuril Islands, recorded about 50 species of aquatic plants on Kunashir Island and Iturup Island. Other records of aquatic plants were rarely found out here and there in the studies of flora and vegetation conducted on the southern Kurils (Miyabe 1890; Kawakami 1901; Takeda 1914; Ohwi 1932a, 1932b, 1933; Matsumura 1934; Miki 1934; Tatewaki 1934, 1939, 1957).

Although many aquatic plant species have become endangered in recent years, relatively few studies have been conducted on aquatic plants of the Kuril Islands to date. This list therefore provides some basic biological information related to the conservation biology of the aquatic plants on these islands.

Materials and Methods

We conducted botanical surveys of the Kunashir and Iturup islands from August 18, 2012 to September 8, 2012. Aquatic plants

were collected from the south of Kunashir Island and the center of Iturup Island (Takahashi et al. 2013). Four botanists collected aquatic plants along the shore on foot, except at Lake Peschanoye, where we sailed across the lake by boat from the southeast shore (Pacific Ocean-side) to the northwest shore (Okhotsk Sea-side). Voucher specimens are deposited in the Herbarium of the Hokkaido University Museum (SAPS).

Results and discussion

A total of 37 species belonging to 16 families of aquatic plants were identified on Kunashir and Iturup Islands; 26 species in 13 families were collected on Kunashir Island, and 21 species in 12 families were collected on Iturup Island (see Appendix). In the two islands, common species are *Potamogeton perfoliatus*, *P. praelongus*, *Persicaria amphibia* and *Hippuris vulgaris*. Barkalov (2009) found *Zostera japonica* only on Kunashir Island. Based on the list, there appeared to be more species of Zosteraceae on Kunashir Island than on Iturup Island, but this bias is partly due to the limited time of our survey. We could not find Hydrocharitaceae, *Trapa* and Alismataceae. However, *Alisma canaliculatum* and *A. plantago-aquatica* var. *orientale* were both recorded on Kunashir Island, the latter is doubted an invasive species (Barkalov 2009).

The type locality of *Sparganium kawakamii* H. Hara (Hara 1938) is given as “Ponto” around Rubetsu on Iturup Island. We could not find this species around Lake Maloye (Rubetsu-numa) and Pioner (Rubetsu). In the monograph of *Sparganium* (Cook and Nicholls 1986) and Japanese aquatic plants identification manual (Kadono 1994), *S. kawakamii* is included in *S. angustifolium* Michx.. On the other hands, Russian botanist recognized two

species. Barkalov (2009) reported that *S. kawakamii* grows in the southern Kurils, *S. angustifolium* was observed to be more common in the northern Kurils. It is necessary to reexamine the confusion on taxonomy about *S. kawakamii*.

In Japan, numerous aquatic plant species are endangered by waterfront developments, and some exotic aquatic plants are also problematic in these environments. We therefore consider it necessary to survey aquatic flora of the Kurils in greater detail.

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APPENDIX

An aquatic plants list of Kunashir and Iturup Islands, collected on a field trip in 2012.

<Ferns and fern allies>

EQUISETACEAE

Equisetum fluviatile L. [Mizu-dokusa]

KUNASHIR: Bog around river at Southeast side of Lake Peschanoye (Lake Tōfutsu). Aug. 18, 2012. T. Fukuda 106, H. Takahashi et al. 35082, Y. Kato 079.

KUNASHIR: Lakeside of Lake Arigel (Southwest of Lake Nikisyoro). Aug. 23, 2012. T. Fukuda 267.

ITURUP: South part of Lake Maloye (Rubetsu numa). Aug. 30, 2012. T. Fukuda 552.

ITURUP: South of Rydovo (Bettobu), pond near old sanatorium. Sept. 1, 2012. T. Fukuda 626.

ISOETACEAE

Isoetes asiatica (Makino) Makino [Hime-mizunira]

KUNASHIR: Furukamappu, Lake Serebyanoye (Furukamappu-numa). Aug. 23, 2012. Y. Kato 242.

<Angiospermae>

ARACEAE

Lemna trisulca L. [Hinzimo]

ITURUP: Nouttheast of Lake Maloye (Rubetsu numa), small pond

on the banks of Kuibyshevka River (Rubetsu river). Aug. 30, 2012. H. Takahashi 35587.

ITURUP: Small ponds, South of Kuibyshevka river near mouth (Rubetsu river). Aug. 30, 2012. T. Fukuda 2012-542.

CYPERACEAE

Eleocharis acicularis (L.) Roem.et Schult. var. *longiseta* Svenson [Matsubai]

KUNASHIR: Furukamappu, Lake Serebyanoye (Furukamappu-numa). Aug. 23, 2012. Y. Kato 258a.

Eleocharis kamtschatica (C.A.Mey.) Kom. [Hime-harii]

KUNASHIR: South of Veslovskyy peninsula (Keramui-misaki), freshwater pond among meadow. Aug. 21, 2012. T. Fukuda 208.

Eleocharis mamillata H. Lindb. var. *cyclocarpa* Kitag. [Ōnuma-harii]

KUNASHIR: Peschanoye Mire (Tōfutsu-sitsugen). Aug. 18, 2012. H. Takahashi et al. 35122.

Eleocharis margaritacea (Hultén) Miyabe et Kudô [Shiromino-harii]

KUNASHIR: Peschanoye Mire (Tōfutsu-sitsugen). Aug. 18, 2012. Y. Kato 087.

Eleocharis palustris (L.) Roem. et Schult. [Kuronuma-harii]

KUNASHIR: Lakeside of Lake Arigel (Southwest of Lake Nikisyoro). Aug. 23, 2012. T. Fukuda 266.

ITURUP: South part of Lake Maloye (Rubetsu numa). Aug. 30, 2012. T. Fukuda 558.

Schoenoplectus tabernaemontani (C.C.Gmel.) Palla [Futoi]

KUNASHIR: Southeast side of Lake Peschanoye (Lake Tōfutsu), at the beginning of Peschanoye River. Aug. 19, 2012. T. Fukuda 133.

Scirpus wichurae Boeck. [Aburagaya]

KUNASHIR: In coniferous forest along road between capes Chetverikova and Puzanova. Aug. 19, 2012. T. Fukuda 304.

KUNASHIR: Peschanoye Mire (Tōfutsu-sitsugen). Aug. 18, 2012. H. Takahashi et al. 35085, Y. Kato 090, H. Sato et al. 01588 (SAPS042189).

HALORAGACEAE

Myriophyllum spicatum L. [Hozakino-fusamo]

KUNASHIR: Peschanoye Mire (Tōfutsu-sitsugen). Aug. 18, 2012. H. Takahashi et al. 35124, H. Sato et al. 01599(SAPS042192).

ITURUP: South part of Lake Maloye (Rubetsu-numa). Aug. 30, 2012. H. Takahashi 35578.

ITURUP: South part of Lake Bragodatnoye (Lake Toshimoi). Sep. 2, 2012. H. Takahashi 35612.

LENTIBULARIACEAE

Utricularia japonica Makino [Tanuki-mo]

KUNASHIR: Cape Veslo (Keramui-zaki), lake near lighthouse. Aug. 21, 2012. H. Takahashi et al. 35267.

MENYANTHACEAE

Menyanthes trifoliata L. [Mitsu-gasiwa]

KUNASHIR: Peschanoye Mire (Tōfutsu-sitsugen). Aug. 18, 2012. H. Takahashi et al. 35087, T. Fukuda 2012-93.

MONTIACEAE

Montia fontana L. [Numa-hakobe]

ITURUP: Osenny (Oito), branch of Osenny river near sea coast. Sept. 4, 2012. T. Fukuda 653.

NYMPHAEACEAE

Nuphar pumila (Timm) DC. var. *pumila* [Nemuro-kōhone]

KUNASHIR: Peschanoye Mire (Tōfutsu-sitsugen), in standing water. Aug. 18-19, 2012. Y. Kato, Photograph!

Nymphaea tetragona Georgi [Hitsujigusa]

KUNASHIR: Around Lake Serebryanoye (Furukamappu-numa). Aug. 23, 26, 2012.

Note: No voucher specimen. This plant was identified by eye in the field.

PLANTAGINACEAE

Callitriche hermaphrodita L. [Chishima-mizuhakobe]

ITURUP: South part of Lake Maloye (Rubetsu-numa). Aug. 30, 2012. T. Fukuda 555, H. Takahashi 35582.

Hippuris vulgaris L. [Sugina-mo]

KUNASHIR: Bog around river at Southeast side of Lake Peschanoye (Lake Tōfutsu). Aug. 18, 2012. T. Fukuda 2012-96, 2012-113.

KUNASHIR: South of Veslovskyy penninsula (Keramui-misaki), in freshwater pond among meadow. Aug. 21, 2012. T. Fukuda 2012-210.

KUNASHIR: Cape Veslo (Keramui-zaki), Lake near lighthouse. Aug. 21, 2012. H. Takahashi et al. 35266.

ITURUP: South part of Lake Maloye (Rubetsu-numa). Aug. 30, 2012. H. Takahashi 35579, T. Fukuda 2012-564.

ITURUP: Small ponds, South of Kuibyshevka river near mouth (Rubetsu river). Aug. 30, 2012. T. Fukuda 2012-549.

ITURUP: South of Rydovo (Bettobu), pond near old sanatorium. Sept. 1, 2012. T. Fukuda 2012-631.

POACEAE

Phragmites australis (Cav.) Trin. ex Steud. [Yoshi]

KUNASHIR: Peschanoye Mire (Tōfutsu-sitsugen). Aug. 18, 2012. H. Takahashi et al. 35097, H. Sato et al. 01620 (SAPS042380).

POLYGONACEAE

Percicaria amphibia (L.) Delarb. [Ezono-mizutade]

KUNASHIR: Lake Arigel (SW of Lake Nikisyoro). Aug. 22, 2012. H. Takahashi 35328.

KUNASHIR: Lake Arigel (SW of Lake Nikisyoro). Aug. 23, 2012. T. Fukuda 2012-275.

ITURUP: South part of Lake Kuibyshevskoye (Rausu-numa). Aug. 30, 2012. H. Takahashi 35569.

ITURUP: East lakeside of Lake Kuibyshevskoye (Rausu-numa). Aug. 30, 2012. T. Fukuda 2012-572.

ITURUP: South part of Lake Maloye (Rubetsu-numa). Aug. 30, 2012. T. Fukuda 2012-557.

ITURUP: West coast of Lake Lebedinoye (Shyana-numa). Sept. 6, 2012. T. Fukuda 694.

POTAMOGETONACEAE

Potamogeton berchtoldii Fieber [Itomo]

ITURUP: Kasatka Bay (Hitokappu-wan), around Chertova skala (Rakko-iwa), in pond. Sept. 2, 2012. H. Takahashi 35600.

Potamogeton compressus L. [Ezoyanagi-mo]

KUNASHIR: East lakeside of Lake Veslovskoye (Lake Keramui), in brackish marsh., Aug. 21, 2012. T. Fukuda 217.

ITURUP: South part of Lake Maloye (Rubetsu-numa). Aug. 30, 2012. T. Fukuda 551a.

ITURUP: North part of Lake Maloye (Rubetsu-numa). Aug. 30, 2012. H. Takahashi 35571.

ITURUP: Lake Lebedinoye (Shana-numa). Sept. 6, 2012. T. Fukuda 693.

Potamogeton fryeri A. Benn. [Futo-hirimushiro]

ITURUP: South of Rydovo (Bettobu), pond near old sanatorium. Sept. 1, 2012. T. Fukuda 630.

***Potamogeton gramineus* L. [Ezono-hirumushiro]**

KUNASHIR: Peschanoye Mire (Tōfutsu-sitsugen). Aug. 18, 2012. H. Sato 01600.

KUNASHIR: Lake Peschanoye (Lake Tōfutsu). Aug. 19, 2012. H. Takahashi et al. 35115a; Y. Kato 083b.

KUNASHIR: Furukamappu, Lake Serebyanoye (Furukamappu-numa). Aug. 23, 2012. Y. Kato 257a; 258c.

KUNASHIR: Southwest part of Lake Arigel (SW of Lake Nikisyoro). Aug. 23, 2012. T. Fukuda 274.

***Potamogeton maackianus* A. Benn. [Sen-ninmo]**

ITURUP: South part of Lake Maloye (Rubetsu-numa). Aug. 30, 2012. T. Fukuda 551b; H. Takahashi 35583.

ITURUP: South coast of Lake Blagodatnye (Toshimoi). Sept. 2, 2012. T. Fukuda 642.

***Potamogeton natans* L. [O-hirumushiro]**

ITURUP: Kasatka Bay (Hitokappu-wan), around Chertova skala (Rakko-iwa), in pond. Sept. 2, 2012. H. Takahashi 35599.

***Potamogeton perfoliatus* L. [Hirohano-ebimo]**

KUNASHIR: South of Lake Peschanoye (Lake Tōfutsu). Aug. 19, 2012. T. Fukuda 180, H. Takahashi et al. 35115a.

KUNASHIR: Northwest side of Lake Arigel (Lake Nikisyoro). Aug. 22, 2012. H. Takahashi 35322.

KUNASHIR: Southwest part of Lake Arigel (Lake Nikisyoro). Aug. 23, 2012. T. Fukuda 274.

KUNASHIR: Furukamappu, Lake Serebyanoye (Furukamappu-numa). Aug. 23, 2012. Y. Kato 257b; 258d.

ITURUP: Mouth of Kuibyshevka (Rubetsu river), in bogs (with stream). Aug. 30, 2012. T. Fukuda 541, 544, 548.

ITURUP: South part of Lake Maloye (Rubetsu-numa). Aug. 30, 2012. T. Fukuda 553; 563, H. Takahashi 35577.

ITURUP: Kuril'sk, within small stream. Sep. 2, 2012. H. Takahashi 35616.

ITURUP: Near mouth of river (Kurokinai river), near Chertova Skala (South of Rakko-iwa). Sept. 2, 2012. T. Fukuda 647.

ITURUP: Southwest coast of coastal lakes, S lake of "Zalivnye" lakes (near Rebun-numa). Sept. 2, 2012. T. Fukuda 648.

***Potamogeton praelongus* Wulfen [Nagaba-ebimo]**

KUNASHIR: Tōfutsu, Lake Peschanoye (Lake Tōfutsu). Aug. 19, 2012. Y. Kato 083a.

KUNASHIR: Furukamappu, Lake Serebyanoye (Furukamappu-numa). Aug. 23, 2012. Y. Kato 258b.

ITURUP: Mouth of Kuibyshevka (Rubetsu river), in bogs (with stream). Aug. 30, 2012. T. Fukuda 541.

ITURUP: Northwest of Lake Maloye, small pond on the banks of Kuibyshevka River (Rubetsu river). Aug. 30, 2012. H. Takahashi 35586.

ITURUP: South part of Lake Maloye (Rubetsu-numa). Aug. 30, 2012. T. Fukuda 556; H. Takahashi 35581.

RANUNCULACEAE

***Ranunculus nipponicus* Nakai var. *submerses* H. Hara [Baika-mo]**

ITURUP: Tornaya Bay (Toro). Aug. 28, 2012. H. Takahashi and T. Fukuda 35426.

***Ranunculus yesoensis* Nakai [Chitosebaika-mo]**

ITURUP: South part of Lake Maloye (Rubetsu-numa). Aug. 30, 2012. T. Fukuda 550, H. Takahashi 35572.

TYPHACEAE

***Sparganium erectum* L. [Mikuri]**

ITURUP: Kuril'sk, at branch of Kurilka river (Shana river). Sept. 7, 2012. T. Fukuda 697.

***Sparganium glomeratum* (Beurl. ex Laest.) L. M. Newman [Tama-mikuri]**

ITURUP: Northwest of Lake Maloye (Rubetsu numa), in pond among the lower reaches of Kuibyshevka river. Aug. 30, 2012. H. Takahashi 35591.

ITURUP: South of Kuibyshevka river (Rubetsu river) near mouth, in a small pond. Aug. 30, 2012. T. Fukuda 532.

ITURUP: Near mouth of river (Kurokinai river), near Chertova Skala (South of Rakko-iwa). Sept. 2, 2012. T. Fukuda 646.

***Typha latifolia* L. [Gama]**

KUNASHIR: Lakeside of Lake Arigel (Southwest of Lake Nikisyoro). Aug. 23, 2012. T. Fukuda 272.

ITURUP: Cut-off channels, North of Kuibyshevka river (Rubetsu river). Aug. 30, 2012. T. Fukuda 533.

ZOSTERACEAE

***Phyllospadix iwatensis* Makino [Sugamo]**

KUNASHIR: Along the beach between northwest coast of Lake Peschanoye (Lake Tōfutsu) and Znamenka cape (Nihon-iwa), in sea. Aug. 19, 2012. H. Takahashi et al. 35179.

KUNASHIR: Along the beach between "13km" Village (Yaitaikotan) and Stolbchatyy Cape (Zaimoku-iwa), in sea. Aug. 22, 2012. H. Takahashi et al. 35310.

ITURUP: Dobrynina Bay (Otoimausi). Stony beach to coastal meadows around fish company. Aug. 27, 2012. H. Takahashi and T. Fukuda 35404.

***Zostera asiatica* Miki [Ōamamo]**

KUNASHIR: East of Lake Veslovskoye (Lake Keramui). Aug. 21, 2012. H. Takahashi et al. 35240.

***Zostera japonica* Asch. et Graebn. [Koamamo]**

KUNASHIR: East lakeside of Lake Veslovskoye (Lake Keramui), in brackish marsh. Aug. 21, 2012. T. Fukuda 205.

KUNASHIR: East of Lake Veslovskoye (Lake Keramui). Aug. 21, 2012. H. Takahashi et al. 35242.

***Zostera marina* L. [Amamo]**

KUNASHIR: East of Lake Veslovskoye (Lake Keramui). Aug. 21, 2012. H. Takahashi et al. 35241.

山崎真実¹, 福田知子², 加藤ゆき恵³, 佐藤広行⁴, 高橋英樹⁵:
2012 年野外調査において国後島および択捉島で採集された水生植物

2012 年の踏査において採集された水生植物は 37 種 16 科で、国後島では 26 種 13 科、択捉島では 21 種 12 科であった。国後島・択捉島で多かった水草は、ヒロハノエビモ、ナガバエビモ、エゾノミズタデ、スギナモであり、特にヒルムシロ属は 8 種が認められた。また海草としてはスガモが比較的多かった。」が認められた。また海草としてはスガモが比較的多かった。これまでの報告において千島列島で確認されていないトチカガミ科、ヒシ属は今回も見つけれ

れなかった．エトロフソウ *Sparganium kawakamii* H. Hara の基準標本産地である留別沼から留別付近を探索したが，該当する種類は確認できなかった．水生植物には絶滅危惧種となっているものも多く，千島列島における水生植物相は十分に明らかにされていないため，今後も重点的に調査を行う必要がある．

- (1 札幌市博物館活動センター，
- 2 国立科学博物館植物部門，
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- 4 北海道大学大学院農学院，
- 5 北海道大学総合博物館)

Takahashi et al. 35115a; Y. Kato 083b.
 KUNASHIR: Furukamappu, Lake Serebyanoye (Furukamappu-numa). Aug. 23, 2012. Y. Kato 257a; 258c.
 KUNASHIR: Southwest part of Lake Arigel (SW of Lake Nikisyoro). Aug. 23, 2012. T. Fukuda 274.
Potamogeton maackianus A. Benn. [Sen-ninmo]
 ITURUP: South part of Lake Maloye (Rubetsu-numa). Aug. 30, 2012. T. Fukuda 551b; H. Takahashi 35583.
 ITURUP: South coast of Lake Blagodatnye (Toshimoi). Sept. 2, 2012. T. Fukuda 642.
Potamogeton natans L. [O-hirumushiro]
 ITURUP: Kasatka Bay (Hitokappu-wan), around Chertova skala (Rakko-iwa), in pond. Sept. 2, 2012. H. Takahashi 35599.
Potamogeton perfoliatus L. [Hirohano-ebimo]
 KUNASHIR: South of Lake Peschanoye (Lake Tōfutsu). Aug. 19, 2012. T. Fukuda 180, Takahashi et al. 35115a.
 KUNASHIR: Northwest side of Lake Arigel (Lake Nikisyoro). Aug. 22, 2012. Takahashi 35322.
 KUNASHIR: Southwest part of Lake Arigel (Lake Nikisyoro). Aug. 23, 2012. T. Fukuda 274.
 KUNASHIR: Furukamappu, Lake Serebyanoye (Furukamappu-numa). Aug. 23, 2012. Y. Kato 257b; 258d.
 ITURUP: Mouth of Kuibyshevka (Rubetsu river), in bogs (with stream). Aug. 30, 2012. T. Fukuda 541, 544, 548.
 ITURUP: South part of Lake Maloye (Rubetsu-numa). Aug. 30, 2012. T. Fukuda 553; 563, Takahashi 35577.
 ITURUP: Kuril'sk, within small stream. Sep. 2, 2012. Takahashi 35616.
 ITURUP: Near mouth of river (Kurokinai river), near Chertova Skala (South of Rakko-iwa). Sept. 2, 2012. T. Fukuda 647.
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Zostera marina L. [Amamo]

KUNASHIR: East of Lake Veslovskoye (Lake Keramui). Aug. 21, 2012. H. Takahashi et al. 35241.

山崎真実¹, 福田知子², 加藤ゆき恵³, 佐藤広行⁴, 高橋英樹⁵:
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Vascular Plants Collected in Peschanoye Mire (Tōfutsu-sitsugen), Kunashir Island in 2012

Hideki Takahashi¹, Hiroyuki Sato², Yukie Kato³ and Tomoko Fukuda⁴

¹The Hokkaido University Museum, N10 W8, Kita-ku, Sapporo, 060-0810 JAPAN; ²Graduate School of Agriculture, Hokkaido University, N9 W9, Kita-ku, Sapporo, 060-8589 JAPAN; ³Kushiro City Museum, 1-7, Shunkodai, Kushiro, 085-0822 JAPAN; ⁴Department of Botany, National Museum of Nature and Science, 4-1-1, Amakubo, Tsukuba, 305-0005 JAPAN.
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Abstract During a field trip in 2012 to Peschanoye Mire, situated on the SE side of Lake Peschanoye, Kunashir Island, in the southern Kurils, 105 species in 42 families of vascular plants were collected. Among them, *Carex cespitosa* is reported for the first time from Kunashir Island. The ratio of naturalized to native plants on Peschanoye (4 spp., ca. 4%) is much lower than that in Kushiro Mire (85 spp., ca. 11%). The *Pinus pumila* scrub in the mire of Peschanoye is noteworthy. The rare occurrence of *Alnus japonica* is another characteristic of Peschanoye Mire.

Key words: *Alnus japonica*, flora, Kunashir, Peschanoye Mire, *Pinus pumila*

Introduction

Alexeeva (1983) reported on the flora of Kunashir Island, and Barkalov (2009) recently clarified the vascular flora of all the Kuril Islands, including Kunashir. To develop a conservation plan on a regional scale, however, a study of the flora and vegetation should be undertaken. There have been several regional studies of the flora and vegetation by Japanese botanists at several sites on Kunashir Island: Mt. Tyatya (Okada 1930), Yuzhno-Kuril'sk (Matsumura 1934), Mt. Mechnikova (Sato 1999), plus reports on special plant groups and the vegetation of Kunashir; *Picea glehnii* forests (Tatewaki and Hirano 1936); forest plants (Tatewaki 1937), and coastal plants (Sato 2007). In this context we provide a preliminary list of the plants of Peschanoye Mire, one of the main mires on Kunashir Island.

Materials and Methods

Peschanoye Mire is formed around Peschanaya River (Fig. 2C), which flows from the SE side of Lake Peschanoye into the Pacific Ocean in the southwestern part of Kunashir (Fig. 1). Lake Peschanoye (Fig. 2D), with a lagoon origin (Barkalov 2009), is regarded as the largest lake in the southern Kurils (Tanaka and Hoshino 1934). The mire is comparatively small (about 3 km² in total area) and is about 10 m above sea level. Four botanists have collected vascular plants independently there, so the species confirmed by many specimens indicate comparatively common plants in the mire. Some plants of meadows on the sand dune on the Pacific Ocean side are also included in the list. Specimens were collected on the following dates.

Specimens of H. Takahashi et al. 35060 to 35108, H. Sato et al. (SAPS042170 to 042193), Y. Kato 2012-033 to 2012-073, 2012-324, 2012-330, and T. Fukuda 2012-80 to 2012-119 were collected on August 18, 2012.

Specimens of H. Takahashi et al. 35111 to 35124 and 35180 to 35183, H. Sato et al. (SAPS042380 to 042391, 042149), Y. Kato 2012-075 to 2012-090 and 2012-325, and T. Fukuda 2012-130, 132, 133, 164, 165, 166, 180 and 184 were collected on August 19, 2012.

All specimens are deposited in the Herbarium of the Hokkaido University Museum (SAPS).

The composition of ten dominant families in the flora of Peschanoye Mire was compared with that of Kushiro Mire (Takahashi and Takashima 1993) in eastern Hokkaido.

Results and Discussion

We collected 105 species in 42 families of vascular plants in Peschanoye Mire (see Appendix). Kushiro Mire includes 738 species in 110 families of vascular plants (Takahashi and Takashima 1993), and Kushiro Mire (about 300 km² in area) is about 100 times larger than Peschanoye Mire. Among the plants recorded here, *Carex cespitosa* is a new record for Kunashir Island. As this species has been reported from the Habomais, Shikotan, Urup, and Ketoi from the Kuril Islands (Barkalov 2009), the presence of it in Kunashir is not unexpected.

Ten dominant families were compared with those of Kushiro Mire (Table 1). The largest three families; Asteraceae, Cyperaceae and Poaceae are the same in both Peschanoye and Kushiro, but among them the species of Asteraceae are much fewer in number than Cyperaceae and Poaceae in Peschanoye Mire.

In Peschanoye Mire, there are only four naturalized species of plants; *Agrostis gigantea*, *Phleum pratense*, *Rumex crispus* and *R. longifolius*. Low ratio of naturalized plants (ca. 4 %) indicates that Peschanoye Mire is comparatively better preserved than Kushiro Mire.

Except for the two largest families; Cyperaceae and Poaceae, the number of species in other families does not differ so widely in

Peschanoye. The family composition is explained by the small size of Peschanoye Mire.

The most significant difference between Peschanoye and Kushiro mires is the presence of *Pinus pumila* scrub in the former mire (Fig. 2E). In Peschanoye, *Picea glehnii* and *P. jezoensis* grow at the margin of the mire, but *Pinus pumila* scrub occurs within the mire together with *Empetrum nigrum* var. *japonicum* and *Rhododendron groenlandicum* subsp. *diversipilosum*. In Hokkaido, invading or remaining *Pinus pumila* in mires is confined to mountainous areas; *Pinus pumila* scrub is not recorded from lowland meadows in Hokkaido. Tatewaki (1935) pointed out that there is no correlation between meadows and *P. pumila* communities, but he also showed an exceptional example of *Pinus pumila* scrub in the central part of meadows near Kawayu in Akan National Park. Kawayu is situated on volcanic inlands (at least above 100 m above sea level) in eastern Hokkaido. *Pinus pumila* scrub in Peschanoye Mire represents an interesting vegetation to be studied.

Alnus japonica is one of the main tree components of lowland mires in Hokkaido, but it occupies only a minor position in the vegetation of Peschanoye. The insignificant presence of *Alnus japonica* (Fig. 2A, B) may be due to the geographical location of Kunashir Island at the eastern limit of the species. *Alnus japonica* was recorded from several mires in southwestern to central Kunashir (Alexeeva 1983).

Moliniopsis japonica, Poaceae, is absent or rare in Kushiro Mire, but its presence was confirmed in Peschanoye Mire. The growing conditions of *M. japonica* in Peschanoye Mire has not been well studied, because of our limited time in the field.

Acknowledgements

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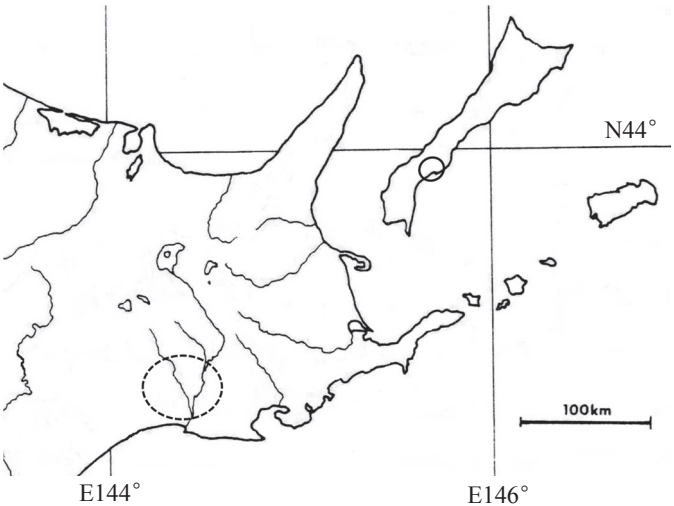


Figure 1. Location of study sites. Peschanoye Mire (solid line) on Kunashir Island and Kushiro Mire (dotted line), Hokkaido.

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APPENDIX.

List of vascular plants in Peschanoye mire, Kunashir Island

<Ferns and Lycophytes>

EQUISETACEAE

Equisetum fluviatile L. [Mizu-dokusa]
H. Takahashi et al. 35082; Y. Kato 2012-079.
Equisetum palustre L. [Inu-sugina]
Y. Kato 2012-062.

LYCOPODIACEAE

Lycopodium clavatum L. [Hikageno-kazura]
H. Takahashi et al. 35084
Lycopodium dendroideum Michx. [Man'nen-sugi]

Table 1. A comparison of the ten dominant families between Peschanoye and Kushiro mires.

Rank	Peschanoye	Rank	Kushiro
1	Cyperaceae (15)	1	Asteraceae (71)
2	Poaceae (12)	2	Cyperaceae (66)
3	Asteraceae (5)	3	Poaceae (63)
	Ericaceae (5)	4	Rosaceae (34)
	Lamiaceae (5)	5	Polygonaceae (26)
6	Juncaceae (4)	6	Lamiaceae (25)
	Polygonaceae (4)	7	Orchidaceae (23)
	Rosaceae (4)	8	Ranunculaceae (22)
9	Pinaceae (3)	9	Caryophyllaceae (18)
	Potamogetonaceae (3)	10	Apiaceae (18)
	Ranunculaceae (3)		

The number of species in parentheses.

- H. Takahashi 35067; T. Fukuda 2012-115.
- OSMUNDACEAE**
Osmundastrum cinnamomeum (L.) C.Presl. var. *fokiense* (Copel.) Tagawa [Yamadori-zenmai]
H. Takahashi et al. 35074; T. Fukuda 2012-105.
- THELYPTERIDACEAE**
Thelypteris nipponica (Franch. et Sav.) Ching [Nikkō-shida]
H. Takahashi et al. 35080; Y. Kato 2012-061; T. Fukuda 2012-97.
Thelypteris palustris (Salisb.) Schott [Hime-shida]
Y. Kato 2012-060.
- WOODSIACEAE**
Deparia pycnosora (H.Christ) M.Kato [Miyama-shikeshida]
Y. Kato 2012-059
- <Gymnospermae>
PINACEAE
Picea glehnii (F.Schmidt) Mast. [Aka-ezomatsu]
H. Takahashi 35066.
Picea jezoensis (Siebold et Zucc.) Carrière [Ezo-matsu]
H. Takahashi, confirmed in the field.
Pinus pumila (Pall.) Regel [Hai-matsu] (Fig. 2E)
H. Takahashi 35070; Y. Kato 2012-058.
- <Angiospermae>
AMARANTHACEAE
Salsola komarovii Iljin [Oka-hijiki]
H. Takahashi et al. 35061. Coastal side.
- APIACEAE**
Angelica genuflexa Nutt. [Ōba-senkyū]
H. Takahashi et al. 35083; T. Fukuda 2012-118.
Cicuta virosa L. [Doku-zeri]
H. Takahashi et al. 35112; T. Fukuda 2012-98.
- AQUIFOLIACEAE**
Ilex crenata Thunb. var. *radicans* (Nakai) Murai [Hai-inutsuge]
H. Takahashi et al. 35107 Deleted!; T. Fukuda 2012-108 Deleted!.
- ASPARAGACEAE**
Hosta sieboldii (Paxton) J.W.Ingram var. *lectifolia* (Nakai) H.Hara [Tachi-gibōshi]
H. Takahashi et al. 35104; Y. Kato 2012-043; T. Fukuda 2012-100.
Maianthemum dilatatum (A.W.Wood) A.Nelson et J.F.Macbr. [Maizuru-sō]
Y. Kato 2012-044.
- ASTERACEAE**
Achillea ptarmica L. subsp. *macrocephala* (Rupr.) Heimerl var. *speciosa* (DC.) Herder [Ezo-nokogirisō]
Y. Kato 2012-065.
Cirsium charkeviczii Barkalov [Ezo-mamiya-azami]
H. Takahashi et al. 35079; H. Sato et al. 01587 (SAPS0042179); T. Fukuda 2012-85.
Cirsium pectinellum A.Gray [Ezono-sawa-azami]
Y. Kato 2012-041
Senecio cannabifolius Less. [Hangon-sō]
H. Takahashi et al. 35099.
Solidago virgaurea L. subsp. *leiocarpa* (Benth.) Hultén var. *leiocarpa* (Benth.) A.Gray f. *japonalpestris* Kitam. [Miyama-akino-kirin-sō]
H. Takahashi et al. 35071; H. Sato et al. 01621 (SAPS042381); Y.
- Kato 2012-042; T. Fukuda 2012-84.
- BETULACEAE**
Alnus japonica (Thunb.) Steud. [Han-noki] (Fig. 2A, B)
H. Takahashi et al. 35081. By the river, rare.
- CAMPANULACEAE**
Lobelia sessilifolia Lamb. [Sawa-gikyō]
H. Takahashi et al. 35064, 35093; Y. Kato 2012-033; T. Fukuda 2012-90.
- CARYOPHYLLACEAE**
Stellaria radians L. [Ezo-ōyama-hakobe]
T. Fukuda 2012-92.
- CELASTRACEAE**
Parnassia palustris L. var. *palustris* [Umebachi-sō]
H. Takahashi et al. 35106.
- CORNACEAE**
Cornus suecica L. [Ezo-gozen-tachibana]
H. Takahashi et al. 35065; Y. Kato 2012-040.
- CYPERACEAE**
Carex cespitosa L. [Kabu-suge] New to Kunashir!
Y. Kato 2012-325.
Carex lasiocarpa Ehrh. subsp. *occultans* (Franch.) Hultén [Mujina-suge]
H. Takahashi et al. 35091, 35095; Y. Kato 2012-070, 2012-085; T. Fukuda 2012-103.
Carex lyngbyei Hornem. [Yarame-suge]
H. Takahashi et al. 35098; Y. Kato 2012-330; H. Sato et al. 01592 (SAPS042193); T. Fukuda 2012-89.
Carex macrocephala Willd. ex Spreng. [Ezono-kōbō-mugi]
H. Takahashi et al. 35062. Coastal side.
Carex middendorffii F.Schmidt [Tomari-suge]
Y. Kato 2012-071; T. Fukuda 2012-86.
Carex omiana Franch. et Sav. [Yachi-kawazusuge]
Y. Kato 2012-086.
Carex pauciflora Lightf. [Takane-harisuge]
Y. Kato 2012-072.
Carex vesicaria L. [Oni-naruko-suge]
H. Sato et al. 01591 (SAPS042178).
Eleocharis mamillata H.Lindb. var. *cyclocarpa* Kitag. [Ōnuma-harii]
H. Takahashi et al. 35122.
Eleocharis margaritacea (Hultén) Miyabe et Kudō [Shiromino-harii]
Y. Kato 2012-087.
Eriophorum gracile K.Koch [Sagi-suge]
H. Takahashi et al. 35114; Y. Kato 2012-088; H. Sato et al. 01586 (SAPS042182).
Eriophorum vaginatum L. subsp. *fauriei* (E.G.Camus) A. et D.Löve [Wata-suge]
H. Takahashi et al. 35096; Y. Kato 2012-047; H. Sato et al. 01589 (SAPS042183); T. Fukuda 2012-107.
Rhynchospora alba (L.) Vahl [Mikazuki-gusa]
H. Takahashi et al. 35105, Y. Kato 2012-073; T. Fukuda 2012-116.
Schoenoplectus tabernaemontani (C.C.Gmel.) Palla [Futo-i]
H. Takahashi 35120; Y. Kato 2012-089.
Scirpus wichuræ Boeck. [Abura-gaya]
H. Takahashi et al. 35085; Y. Kato 2012-090; H. Sato et al. 01588 (SAPS042189).
- DROSERACEAE**
Drosera rotundifolia L. [Mōsen-goke]

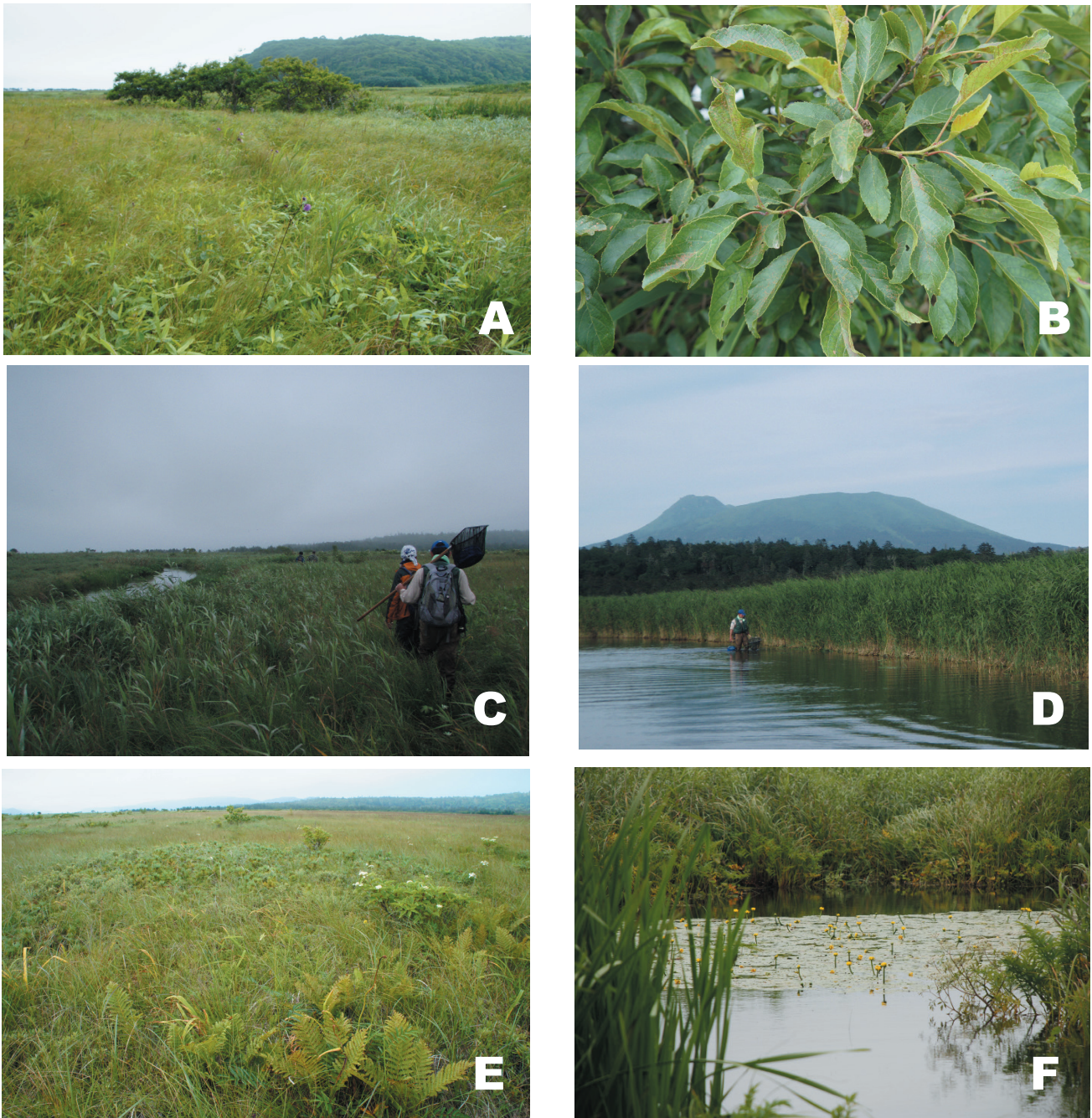


Figure 2. **A.** *Alnus japonica* by river within mire. **B.** *Alnus japonica*. **C.** Peschanoye Mire and Peschanaya River (left), photo by H. Abe. **D.** Southeastern side of Peschanoye Lake and Mt. Mechnikova (back), photo by H. Abe. **E.** *Pinus pumila* scrub within mire. **F.** *Nuphar pumila* in standing water, photo by Y. Kato.

H. Takahashi et al. 35089; Y. Kato 2012-050; T. Fukuda 2012-82.

ERICACEAE

Andromeda polifolia L. [Hime-shakunage]

H. Takahashi 35073; Y. Kato 2012-039.

Empetrum nigrum L. var. *japonicum* K.Koch [Gankō-ran]
Y. Kato 2012-324.

Rhododendron groenlandicum (Oeder) K.Kron et Judd subsp. *diversipilosum* (Nakai) Yonek. var. *diversipilosum* (Nakai) Yonek. [Karafuto-isotsutsuji]

H. Takahashi et al. 35094.

Vaccinium oxycoccus L. [Tsuru-kokemomo]

H. Takahashi et al. 35072; Y. Kato 2012-038; T. Fukuda 2012-81.

Vaccinium vitis-idaea L. [Kokemomo]

H. Takahashi et al. 35078; Y. Kato 2012-037.

FABACEAE

Lathyrus japonicus Willd. [Hama-endō]

T. Fukuda 2012-95. Coastal side.

Thermopsis lupinoides (L.) Link [Sendai-hagi]

T. Fukuda 2012-104.

GENTIANACEAE

Halenia corniculata (L.) Cornaz [Hana-ikari]

H. Takahashi et al. 35108; H. Sato et al. 01596 (SAPS042185); T. Fukuda 2012-114.

HALORAGACEAE

Myriophyllum spicatum L. [Hozakino-fusamo]

H. Takahashi et al. 35124; H. Sato et al. 01599 (SAPS042192).

HYDRANGEACEAE

Hydrangea paniculata Siebold [Nori-utsugi]

H. Takahashi 35077; Y. Kato 2012-051 (f. *debilis* (Nakai) Sugim. [Hidaka-noriutsugi]), 2012-052; T. Fukuda 2012-101.

HYPERICACEAE

Hypericum erectum Thunb. [Otogiri-sō]
Y. Kato 2012-078.

IRIDACEAE

Iris ensata Thunb. var. *spontanea* (Makino) Nakai ex Makino et Nemoto [Nohana-shōbu]
H. Takahashi et al. 35111.
Iris setosa Pall. ex Link [Hiōgi-ayame]
T. Fukuda 2012-80. In fruit.

JUNCACEAE

Juncus covillei Piper [Sekishō-i]
Y. Kato 2012-066.
Juncus decipiens (Buchenau) Nakai f. *gracilis* (Buchenau) Satake [Hime-i]
H. Takahashi et al. 35092.
Juncus filiformis L. [Ezo-hosoi]
H. Takahashi 35069; Y. Kato 2012-045.
Juncus prismatocarpus R.Br. subsp. *leschenaultii* (J.Gay ex Laharpe) Kirschner [Kōgai-zekishō]
H. Takahashi et al. 35121.

LAMIACEAE

Lycopus uniflorus Michx. [Ezo-shirone]
T. Fukuda 2012-112.
Mentha canadensis L. [Hakka]
H. Takahashi et al. 35113; Y. Kato 2012-075.
Scutellaria yezoensis Kudō [Ezo-namiki]
H. Takahashi et al. 35086; Y. Kato 2012-034; T. Fukuda 2012-110.
Scutellaria strigillosa Hemsl. [Namiki-sō]
H. Sato et al. 01594 (SAPS042190).
Stachys aspera Michx. var. *baicalensis* (Fisch. ex Benth.) Maxim. [Ezo-inugoma]
H. Takahashi 35076; Y. Kato 2012-076; T. Fukuda 2012-99.

LYTHRACEAE

Lythrum salicaria L. [Ezo-misohagi]
H. Takahashi et al. 35102; T. Fukuda 2012-87.

MENYANTHACEAE

Menyanthes trifoliata L. [Mitsu-gasiwa]
H. Takahashi et al. 35087; T. Fukuda 2012-93.

MYRICACEAE

Myrica gale L. var. *tomentosa* C.DC. [Yachi-yanagi]
H. Takahashi et al. 35068, Y. Kato 2012-057; T. Fukuda 2012-102.

NYMPHAEACEAE

Nuphar pumila (Timm) DC. var. *pumila* [Nemuro-kōhone] (Fig. 2F)
Y. Kato, photograph!. In standing water.

ORCHIDACEAE

Platanthera tipuloides (L.f.) Lindl. subsp. *tipuloides* var. *sororia* (Schltr.) Soō [Hosobano-kisochidori]
H. Takahashi et al. 35181. Deleted!; T. Fukuda 2012-109. Deleted!
Spiranthes sinensis (Pers.) Ames [Neji-bana]
H. Sato et al. 01595 (SAPS042191).

OROBANCHACEAE

Pedicularis resupinata L. subsp. *teucrifolia* (M.Bieb. ex Steven) T.Yamaz. [Birōdo-shiogama]
Y. Kato 2012-077; T. Fukuda 2012-117.

PLANTAGINACEAE

Hippuris vulgaris L. [Sugina-mo]
T. Fukuda 2012-96, 2012-113.
Veronica americana (Raf.) Schwein. ex Benth. [Ezono-kawajisha]
H. Takahashi et al. 35117; H. Sato 01514 (SAPS042149).

POACEAE

Agrostis clavata Trin. [Yama-nukabo]
H. Sato et al. 01593 (SAPS042158), 01597 (SAPS042159), 01629 (SAPS042389).
Agrostis gigantea Roth [Konukagusa] Naturalized!
H. Sato et al. 01598 (SAPS042160).
Calamagrostis purpurea (Trin.) Trin. subsp. *langsдорffii* (Link) Tzvelev [Iwa-no-gariyasu]
Y. Kato 2012-046; H. Sato et al. 01662, 01663, 01680, 01681, 01685, 01686, 10687, 01688 (SAPS042170 to 042177).
Calamagrostis stricta (Timm) Koeler subsp. *inexpansa* (A.Gray) C.W.Greene [Chishima-gariyasu]
H. Takahashi et al. 35103, 35182; H. Sato et al. 01657, 01658, 01664, 01674, 01675, 01676, 01677, 01678, 01679 (SAPS042161 to 042169).
Elymus dahuricus Turcz. ex Griseb. [Hama-mugi]
H. Sato et al. 01610, 01611 (SAPS042180, 042181).
Festuca rubra L. [Ō-ushinoke-gusa]
H. Sato et al. 01609 (SAPS042184).
Glyceria alnasteretum Kom. [Miyama-dojyō-tsunagi]
H. Sato et al. 01630 (SAPS042390), 01631 (SAPS042391).
Leymus mollis (Trin. ex Spreng.) Pilg. [Hama-nin'niku]
H. Sato et al. 01602 (SAPS042186).
Moliniopsis japonica (Hack.) Hayata [Numa-gaya]
H. Sato et al. 01625 (SAPS042385), 01626 (SAPS042386).
Phalaris arundinacea L. [Kusa-yoshi]
H. Sato et al. 01623 (SAPS042383), 01624 (SAPS042384).
Phleum pratense L. [Ō-awagaeri] Naturalized!
Y. Kato 2012-048; H. Sato et al. 01590 (SAPS042187), 01622 (SAPS042382).
Phragmites australis (Cav.) Trin. ex Steud. [Yoshi]
H. Takahashi et al. 35097; H. Sato et al. 01620 (SAPS042380).

POLYGONACEAE

Persicaria lapathifolia (L.) Delarbre var. *incana* (Roth) H.Hara [Sanae-tade]
H. Takahashi et al. 35118.
Rumex crispus L. [Nagaba-gishigishi] Naturalized!
H. Takahashi 35063.
Rumex longifolius DC. [No-daiō] Naturalized!
H. Takahashi et al. 35100, Y. Kato 2012-057.
Rumex maritimus L. var. *ochotskius* (Rech.f.) Kitag. [Kogane-gishigishi]
Y. Kato 2012-080

POTAMOGETONACEAE

Potamogeton gramineus L. [Ezo-hirumushiro]
Y. Kato 2012-083b; H. Sato et al. 01600 (SAPS042188)
Potamogeton perfoliatus L. [Hirohano-ebimo]
H. Takahashi et al. 35115; ; T. Fukuda 2012-180.
Potamogeton praelongus Wulfen [Nagaba-ebimo]
Y. Kato 2012-083a

PRIMULACEAE

Lysimachia europaea (L.) U.Manns et Anderb. [Tsumatori-sō]
H. Takahashi et al. 35075.
Lysimachia vulgaris L. subsp. *davurica* (Ledeb.) Tatew. [Kusa-redama]
H. Takahashi et al. 3518. In the meadow, Rare.

RANUNCULACEAE

Coptis trifolia (L.) Salisb. [Mitsuba-ōren]

Y. Kato 2012-049; T. Fukuda 2012-81b.

Caltha sp.

T. Fukuda 2012-94.

Note: Because this specimen was sterile, we hesitate to determine it in species rank.

Ranunculus (Subg. *Batrachium*) sp. [Baikamo-zoku]

H. Takahashi et al. 35123; Y. Kato 2012-083c. In the transition water zone between river and lake.

Note: This specimen has no flowers, so it is difficult to determine in species rank.

ROSACEAE

Comarum palustre L. [Kurobana-rōge]

H. Takahashi et al. 35088; Y. Kato 2012-053; T. Fukuda 2012-91.

Potentilla anserina L. subsp. *pacifica* (Howell) Rousi [Ezo-tsurukinbai]

H. Takahashi et al. 35060

Sanguisorba tenuifolia Fisch. ex Link var. *tenuifolia* [Nagabonowaremokō]

Y. Kato 2012-054.

Sorbus commixta Hedl. [Nanakamado]

Y. Kato 2012-055.

RUBIACEAE

Galium trifidum L. subsp. *columbianum* (Rydb.) Hultén [Hosobano-yotsuba-mugura]

H. Takahashi et al. 35116; Y. Kato 2012-036; T. Fukuda 2012-88.

Rubia jesoensis (Miq.) Miyabe et T. Miyake [Akane-mugura]

H. Takahashi et al. 35101; Y. Kato 2012-035; T. Fukuda 2012-83.

VIOLACEAE

Viola verecunda A. Gray [Tsubo-sumire]

H. Takahashi et al. 35119.

高橋英樹¹, 佐藤広行², 加藤ゆき恵³, 福田知子⁴: 2012 年に国後島東沸湿原で採集された維管束植物

2012 年の野外植物調査の際に、国後島東沸湿原で 42 科 105 種の維管束植物を採集した。このうちカブスゲは国後島からの初記録であった。これまで歯舞群島、色丹島、ウルップ島、ケトイ島から報告があるので、国後島での自生は十分予想されることである。東沸湿原の植物相を北海道東部の釧路湿原と比較した。最大 3 植物科はキク科、カヤツリグサ科、イネ科であり、東沸湿原と釧路湿原の両地域とも同じだった。しかし釧路湿原で 1 番だったキク科が東沸湿原では 3 番に下がり、しかも種数が上位 2 科に較べるとかなり少なく、4 番目以降の科の種数とそれほどの差がなかった。つまり東沸湿原では上位 2 科のカヤツリグサ科、イネ科を除いたそれ以降の科の種数は極端に少なく、互いにあまり差がなかった。このような東沸湿原における科の単調さやキク科の種数の少なさは、湿原面積の狭さと乾燥したかく乱地の少なさによると思われる。これは東沸湿原で外来種が 4 種しか見られなかったことにも反映されている。低地の東沸湿原において見られた湿原内ハイマツ低木林は北海道では見られない例であり、興味深い植生である。また東沸湿原においてハンノキの出現が限られているのは、国後島が本種の地理分布の東限にあたっているせいだと思われる。

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Vascular Plants Collected on the Veslovskiy Peninsula, Kunashir Island in 2012

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Abstract During a field trip in 2012 to the Veslovskiy peninsula of Kunashir Island in the southern Kurils, 72 species in 24 families of vascular plants were collected. The floristic composition of Veslovskiy was compared with Notsuke of eastern Hokkaido. The general flora is similar between the two regions, except that forest vegetation is lacking in Veslovskiy. The relative dominance of the families; Rosaceae, Ranunculaceae, Ericaceae, and Violaceae in Notsuke can be explained by the presence of the forest vegetation. We could not confirm the forest vegetation in Veslovskiy. *Rhinanthus minor* and *Leontodon autumnalis*, which occur on Kunashir, are naturalized plants peculiar to Far Eastern Russia. They may become invaders on Hokkaido. *Cakile edentula*, on sandy beaches, has recently invaded the southern Kurils via seed dispersal through ocean currents from northern Hokkaido or Sakhalin.

Key words: flora, Kunashir, Notsuke, vascular plants, Veslovskiy

Introduction

The Veslovskiy peninsula is situated at the southern tip of Kunashir Island, and is separated from the Notsuke peninsula of eastern Hokkaido by a strait approximately 16 km wide (Fig. 1). As the general vegetation of the Veslovskiy peninsula appears similar to that of the Notsuke peninsula, it was natural to compare the plant species composition of the two regions.

Many studies of the vegetation and flora have been carried out by Japanese botanists on the Notsuke peninsula (Ito 1959, 1961, 1963a, 1963b, 1970; Hasegawa and Karino 1977; Hasegawa and Tsujii 1987). Ito (1959) recognized five plant communities; 1) sand beach community, 2) salt marsh community, 3) swamp community, 4) meadow community, and 5) forest community within the the Notsuke peninsula vegetation.

Ito (1961) carried out ecological studies on the salt marsh vegetation in Notsuke. He listed species of *Triglochin*, *Salicornia europaea*, *Puccinellia kurilensis*, *Carex ramenskii* and so on in characteristic salt marsh communities and showed the successional process of salt marsh communities schematically (Ito 1963b).

Ito (1963a) described the general vegetation of the Notsuke peninsula and listed 122 taxa found there. He especially commented on the presence of *Ranunculus reptans* L. and *Crataegus maximowiczii* C.K.Schneid. from a phytogeographic point of view. Ito (1970) studied the forest vegetation on the Notsuke peninsula and recognized three forest communities; 1) broad leaved forest community, 2) mixed forest community, and 3) needle leaved forest community. Recently, wither death of several species of trees was reported on Notsuke due to ground subsidence (Hasegawa and Karino 1977; Hasegawa and Tsujii 1987). The present condition and several problems in nature conservation in

the area have also been mentioned (Morita 2007, 2013).

Although many floristic and vegetational studies have been undertaken in Hokkaido on a regional scale, such studies on Kunashir Island are scarce. The present study on the regional flora of Kunashir will therefore provide basic biological information for the conservation of nature on the island.

Materials and Method

We surveyed the plants of Veslovskiy peninsula (Fig. 1), Kunashir Island on August 21, 2012. The Veslovskiy peninsula is about eight kilometers long by 0.2 to 1.6 km wide, and occupies an area of about 6.5 km². In comparison, the total land area of the Notsuke peninsula is roughly estimated to be about 28 km². The Veslovskiy peninsula is about one fourth the area of the Notsuke peninsula.

Four Japanese botanists collected vascular plants independently, which are summarized here in a preliminary list (see Appendix). Family and species names generally follow Murata and Yonekura (2012), and are ordered alphabetically in the list. All specimens are deposited in the Herbarium of the Hokkaido University Museum (SAPS). The comparable vascular plant list of Notsuke was compiled based on Ito (1963, 1970) and additionally Morita (2007, 2013).

Results and Discussion

We collected 72 species in 24 families of vascular plants on the Veslovskiy peninsula (see Appendix). As there are 211 species and 65 families reported for the Notsuke peninsula, the number of species on Veslovskiy is about one third that of Notsuke.

A comparison of the dominant families between the Notsuke peninsula, Hokkaido and the Veslovskiy peninsula of Kunashir (Table 1) shows the relative dominance of the families; Rosaceae, Ranunculaceae, Ericaceae, Violaceae and so on in Notsuke. This can be explained by the absence of the forest vegetation in Veslovskiy.

The Veslovskiy peninsula is composed of coastal sand dune (Fig. 2F), coastal meadows (Fig. 2D), salt lake (Lake Veslovskoe, Fig. 2A), salt marsh (Fig. 2B, C), several ponds (Fig. 2E), and disturbed wasteland, but forest vegetation was not found in our field examination. Trees such as *Abies sachalinensis*, *Picea jezoensis*, *Betula ermanii*, *Quercus crispula* which grow at Notsuke were not found in Veslovskiy. Similarly ten species of ferns and lycophytes recorded from Notsuke were not collected in Veslovskiy partly due to our limited time in the field in Veslovskiy. The findings indicate that the vegetation of the Veslovskiy peninsula is at an earlier stage of succession than on the Notsuke peninsula.

But recent decline in forest vegetation due to ground subsidence on Notsuke (Hasegawa and Karino 1977; Hasegawa and Tsujii 1987; Morita 2013) will bring about closer resemblance of the floras of the two regions.

Similar salt marsh vegetation is found at both Notsuke and Veslovskiy. This vegetation is characterized by *Salicornia europaea* (Fig. 2B), *Juncus gracillimus*, *Triglochin maritima* (Fig. 2C), *Puccinellia kurilensis*, and so on. Water plants such as *Utricularia japonica* and *Hippuris vulgaris*, were collected from fresh water ponds of Veslovskiy, but have not been recorded from Notsuke. Sea grasses, such as *Zostera*, were found at Veslovskiy, *Zostera marina* is one of the main components of the eco-system of the Bay of Notsuke.

Ranunculus reptans and *Crataegus maximowiczii* are regarded as important plants at Notsuke from a phytogeographic point of view (Ito 1963). *Ranunculus reptans* was collected on several islands in the Kurils, including Kunashir, but was not recorded at Veslovskiy. *Crataegus maximowiczii* has not been recorded from the Kurils (Barkalov 2009).

As there are many disturbed wastelands in the Veslovskiy peninsula, we found 16 naturalized species, including common worldwide naturalized plants such as *Achillea millefolium*, *Agrostis gigantea*, *Phleum pratense*, *Rumex acetosella*, and so on. Among them, *Rhinanthus minor* and *Leontodon autumnalis* are common

naturalized plants characteristic of the Russian Far East, including Sakhalin and the Kurils. These species have not substantially invaded in Hokkaido (Igarashi 2001), but are likely to be invaders on Hokkaido in the future.

On Veslovskiy, *Cakile edentula* (Fig. 2G) was found on coastal sandy beaches (cf. Fukuda et al. 2013). *Cakile edentula* has recently invaded the southern Kurils by seeds dispersed by ocean currents from northern Hokkaido or Sakhalin. *Cakile edentula* has not been found at Notsuke, but we anticipate its invasion because of recent records of its presence around Notsuke (Sukeno and Obata 2012).

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Table 1. A comparison of the dominant families between Notsuke of Hokkaido and Veslovskiy of Kunashir.

Rank	Notsuke	Rank	Veslovskiy
1	Asteraceae (21)	1	Asteraceae (14)
2	Poaceae (18)	2	Poaceae (13)
3	Rosaceae (17)	3	Caryophyllaceae (6)
4	Cyperaceae (12)	4	Cyperaceae (5)
5	Apiaceae (8)	5	Juncaceae (4)
	Ranunculaceae (8)	6	Amaranthaceae (3)
7	Ericaceae (7)		Apiaceae (3)
	Violaceae (7)		Polygonaceae (3)
9	Caryophyllaceae (6)		Zosteraceae (3)
	Juncaceae (6)	10	Lamiaceae (2)
11	Polygonaceae (5)		Plantaginaceae (2)
	Fabaceae (5)		Rosaceae (2)
	Plantaginaceae (5)		Rubiaceae (2)

The number of species in parentheses.

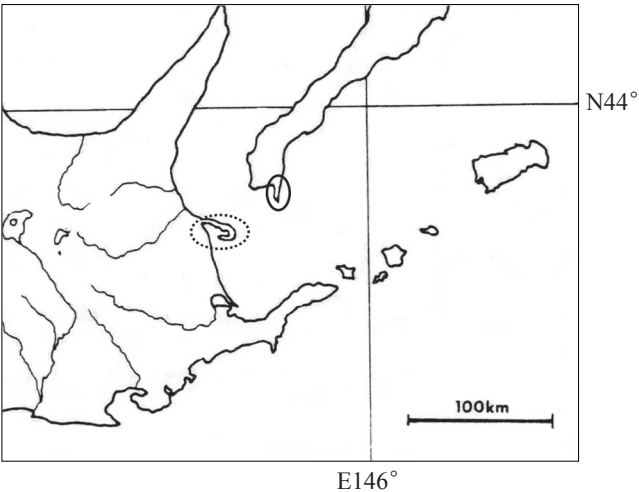


Figure 1. Location of study sites. Veslovskiy Peninsula (solid line) of Kunashir Island and Notsuke Peninsula (dotted line) of Hokkaido.

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APPENDIX.

List of vascular plants on the Veslovskiy peninsula, Kunashir Island

AMARANTHACEAE

- Atriplex patens* (Litv.) Iljin [Hosoba-hama-akaza]
H. Takahashi et al. 35258; Y. Kato 2012-141; T. Fukuda 2012-233.
- Atriplex subcordata* Kitag. [Hama-akaza]
H. Takahashi et al. 35259; Y. Kato 2012-142; T. Fukuda 2012-226.
- Salicornia europaea* L. [Akkeshi-sō]
H. Takahashi et al. 35262; H. Sato 01536, Y. Kato 2012-140; T. Fukuda 2012-225.

APIACEAE

- Bupleurum longiradiatum* Turcz. [Hotaru-saiko s.l.]
H. Takahashi et al. 35254.
- Cicuta virosa* L. [Doku-zeri]
T. Fukuda 2012-212.
- Ligusticum scoticum* L. [Maruba-tōki]
T. Fukuda 2012-235.

ASPARAGACEAE

- Maianthemum dilatatum* (A.W.Wood) A.Nelson et J.F.Macbr. [Maizuru-sō]
Y. Kato 2012-150.

ASTERACEAE

- Achillea alpina* L. subsp. *japonica* (Heimerl) Kitam. [Kitanokogirisō]
H. Takahashie et al. 35252; Y. Kato 2012-162; T. Fukuda 2012-214.
- Achillea millefolium* L. [Seiyō-nokogiri-sō] Naturalized!
H. Takahashi et al. 35237; T. Fukuda 2012-222.
- Achillea ptarmica* L. subsp. *macrocephala* (Rupr.) Heimerl var. *speciosa* (DC.) Herder [Ezo-nokogiri-sō]
Y. Kato 2012-340.
- Artemisia koidzumii* Nakai [Hiroha-urajiro-yomogi]
H. Takahashi et al. 35249.
- Artemisia stelleriana* Besser [Shiro-yomogi]
T. Fukuda 2012-218.
- Cirsium kamtschaticum* Ledeb. ex DC. [Chishima-azami]

- H. Takahashi et al. 35248.
- Gnaphalium uliginosum* L. [Hime-chichiko-gusa] Naturalized!
H. Takahashi et al. 35273.
- Ixeris repens* (L.) A.Gray [Hama-nigana]
T. Fukuda 2012-219.
- Leontodon autumnalis* L. [Akino-tanpoopo-modoki] Naturalized!
Y. Kato 2012-154.
- Ligularia hodgsonii* Hook.f. [Tōge-buki]
H. Takahashi et al. 35253.
- Matricaria matricarioides* (Less.) Ced.Porter ex Britton [Koshikagiku] Naturalized!
H. Takahashi et al. 35236; T. Fukuda 2012-223.
- Senecio nemoralis* L. [Kion]
Y. Kato 2012-153.
- Sonchus brachyotus* DC. [Hachijyō-na]
T. Fukuda 2012-221, 2012-238.
- Tripleurospermum tetragonospermum* (F.Schmidt) Poped. [Shikagiku]
H. Takahashi et al. 35277; Y. Kato 2012-164; T. Fukuda 2012-220.

BRASSICACEAE

- Cakile edentula* (Bigelow) Hook. [Onihama-daikon] Naturalized!
H. Takahashi et al. 35239, 35244, 35276; Y. Kato 2012-138; T. Fukuda 2012-237, 2012-241.

CAPRIFOLIACEAE

- Lonicera caerulea* L. subsp. *edulis* (Regel) Hultén var. *edulis* Regel [Keyonomi]
H. Takahashi et al. 35250.

CARYOPHYLLACEAE

- Arenaria lateriflora* L. [Ōyama-husuma]
Y. Kato 2012-139.
- Dianthus superbus* L. var. *superbus* [Ezo-kawara-nadeshiko]
Y. Kato 2012-136.
- Spergula arvensis* L. var. *sativa* (Boenn.) Mert. et WDJ.Koch [Ō-tsumekusa] Naturalized!
H. Takahashi et al. 35272.
- Spergularia marina* (L.) Griseb. [Ushio-tsumekusa]
H. Takahashi et al. 35257; Y. Kato 2012-143; T. Fukuda 2012-230.
- Stellaria graminea* L. [Karafuto-hosoba-hakobe] Naturalized!
Y. Kato 2012-144.
- Stellaria humifusa* Rottb. [Ezo-hakobe]
H. Takahashi 35256; T. Fukuda 2012-215, 2012-234.

CORNACEAE

- Cornus suecica* L. [Ezo-gozen-tachibana]
Y. Kato 2012-156.

CYPERACEAE

- Carex arenicola* F.Schmidt [Kuro-kawazu-suge]
Y. Kato 2012-175, 2012-174.
- Carex caryophylla* Latour. var. *microtricha* (Franch.) Kük. [Chasiba-suge]
Y. Kato 2012-171, 2012-339.
- Carex gmelinii* Hook. et Arn. [Nemuro-suge]
Y. Kato 2012-172; 2012-334; T. Fukuda 2012-213.
- Carex lyngbyei* Hornem. [Yarame-suge]
T. Fukuda 2012-209.
- Carex macrocephala* Willd. ex Spreng. [Ezono-kōbō-mugi]
Y. Kato 2012-173.

GERANIACEAE

- Geranium yesoense* Franch. et Sav. [Ezo-hūro]
H. Takahashi et al. 35246; Y. Kato 2012-155.

HALORAGACEAE

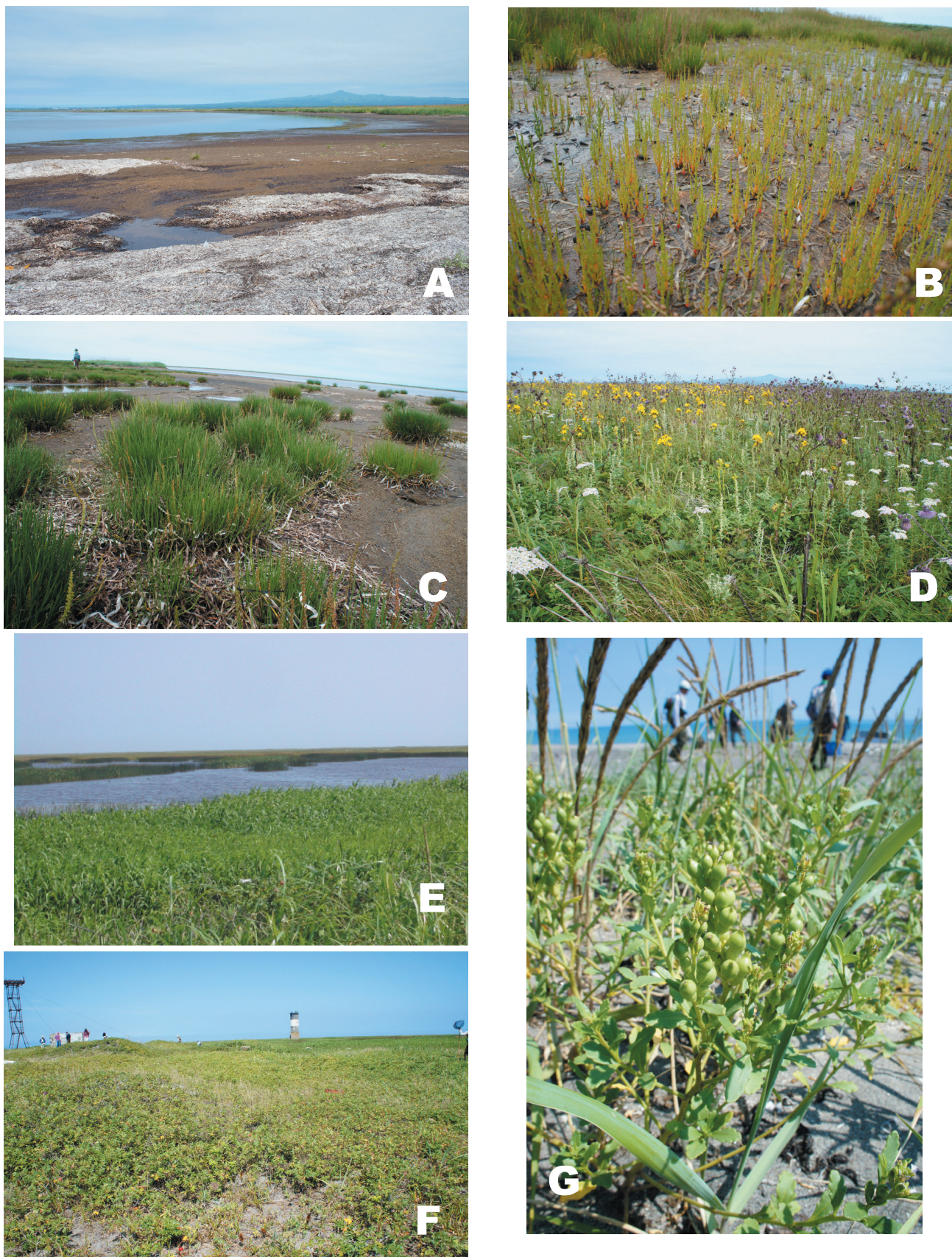


Figure 2. A. Lake-side of Veslovskoye. B. *Salicornia europaea* community. C. *Triglochin maritima* community. D. Meadows on coastal sand. E. Fresh water pond on the Veslovskiy peninsula. F. Meadow with *Rosa rugosa* scrubs at the edge of sandy beach. G. *Cakile edentula*, on sandy beaches, a new invader on the southern Kurils.

***Myriophyllum* sp.**

T. Fukuda 2012-207-a

Note: According to Barkalov (2009), it may be *M. spicatum* L. But in the present study, we hesitate to determine it because of its sterile stage.

JUNCACEAE

***Juncus bufonius* L.** [Hime-kōgai-zekishō] Naturalized!

H. Takahashi et al. 35274.

***Juncus covillei* Piper** [Sekishō-i]

Y. Kato 2012-169.

***Juncus decipiens* (Buchenau) Nakai** [Igusa]

Y. Kato 2012-149.

***Juncus gracillimus* (Buchenau) V.I.Krecz. et Gontsch.** [Doro-i]

H. Takahashi et al. 35261; Y. Kato 2012-332; T. Fukuda 2012-229.

JUNCAGINACEAE

Triglochin maritima L. [Marumino-shibana, Ō-shibana]

H. Takahashi et al. 35265; Y. Kato 2012-151, 152; H. Sato 01545; T. Fukuda 2012-224.

LAMIACEAE

Scutellaria strigillosa Hemsl. [Namiki-sō]

Y. Kato 2012-159.

Stachys aspera Michx. var. *baicalensis* (Fisch. ex Benth.) Maxim. [Ezo-inugoma]

Y. Kato 2012-160; T. Fukuda 2012-211.

LENTIBULARIACEAE

Utricularia japonica Makino. [Tanuki-mo]

H. Takahashi et al. 35267; T. Fukuda 2012-207b

OROBANCHACEAE

Rhinanthus minor L. [Okuezo-garagara] Naturalized!

H. Takahashi et al. 35275; Y. Kato 2012-148.

PLANTAGINACEAE

Hippuris vulgaris L. [Sugina-mo]

H. Takahashi et al. 35266; T. Fukuda 2012-210.

Plantago camtschatica Cham. ex Link [Ezo-ōbako]

Y. Kato 2012-161.

POACEAE

Agrostis clavata Trin. var. *clavata* [Yama-nukabo]

H. Sato 01547

Agrostis gigantea Roth [Konuka-gusa] Naturalized!

H. Takahashi et al. 35271.

Calamagrostis epigeios (L.) Roth [Yama-awa]

H. Takahashi et al. 35255, 35264; H. Sato 01554, 01555, 01556, 01557; T. Fukuda 2012-236.

Calamagrostis purpurea (Trin.) Trin. subsp. *langsдорffii* (Link) Tzvelev [Iwa-no-gariyasu]

H. Sato 01551, 01552, 01553.

Calamagrostis stricta (Timm) Koeler subsp. *inexpansa* (A.Gray) C.W.Greene [Chishima-gariyasu]

H. Sato 01540, 01541, 01542, 01543, 01544.

Elymus dahuricus Turcz. ex Griseb. [Hama-mugi]

Y. Kato 2012-147; H. Sato 01537, 01538, 01539.

Festuca ovina L. [Ushinoke-gusa]

Y. Kato 2012-145; H. Sato 01546.

Leymus mollis (Trin. ex Spreng.) Pilg. [Tenki-gusa, Hamanin'niku]

T. Fukuda 2012-240; H. Sato 01831, 01832.

Phleum pratense L. [Ō-awagaeri] Naturalized!

H. Takahashi et al. 35245; H. Sato 01548.

Poa annua L. [Suzumeno-katabira] Naturalized!

H. Takahashi et al. 35238.

Poa trivialis L. [Ō-suzumeno-katabira] Naturalized!

H. Sato 01549, 01550.

Puccinellia kurilensis (Takeda) Honda [Chishima-dojyōtsunagi]

H. Sato 01562, 01563, 01564, 01619, 01699, 01700.

Trisetum sibiricum Rupr. [Chishima-kanitsuri]

H. Takahashi 35251; H. Sato 01558, 01559, 01560, 01561.

POLYGONACEAE

Polygonum aviculare L. subsp. *neglectum* (Besser) Arcang. [Okumichiyana] Naturalized!

H. Takahashi et al. 35235.

Polygonum polyneuron Franch. et Sav. [Akino-michiyana] Naturalized!

H. Takahashi et al. 35243.

Rumex acetosella L. [Hime-suiba] Naturalized!

Y. Kato 2012-146.

PRIMULACEAE

Lysimachia maritima (L.) Galasso, Banfi et Soldano var. *obtusifolia* (Fernald) Yonek. [Umi-midori]

H. Takahashi et al. 35263; Y. Kato 2012-157, 2012-163; T. Fukuda 2012-228.

RANUNCULACEAE

Thalictrum minus L. var. *hypoleucum* (Siebold et Zucc.) Miq. [Aki-karamatsu]

H. Takahashi et al. 35247; Y. Kato 2012-137.

ROSACEAE

Potentilla anserina L. subsp. *pacifica* (Howell) Rousi [Ezo-tsurukinbai]

H. Takahashi 35260; Y. Kato 2012-166; T. Fukuda 2012-227, 2012-231.

Rosa rugosa Thunb. [Hama-nasu]

T. Fukuda 2012-232.

RUBIACEAE

Rubia jesoensis (Miq.) Miyabe et T.Miyake [Akane-mugura]

T. Fukuda 2012-216.

Galium verum L. subsp. *asiaticum* (Nakai) T.Yamaz. var. *trachycarpum* DC. [Ezono-kawara-matsuba]

Y. Kato 2012-158.

ZOSTERACEAE

Zostera asiatica Miki [Ō-amamo]

H. Takahashi et al. 35240.

Zostera japonica Asch. et Graebn. [Ko-amamo]

H. Takahashi et al. 35242; T. Fukuda 2012-205.

Zostera marina L. [Amamo]

H. Takahashi et al. 35241.

高橋英樹¹, 佐藤広行², 加藤ゆき恵³, 福田知子⁴: 2012 年に国後島ケラムイ半島で採集された維管束植物

2012 年の植物調査において、国後島ケラムイ半島で 24 科 72 種の維管束植物を採集し、その植物相を北海道東部の野付半島と比較した。塩湿地植生を持つ点で両地域は似ていたが、ケラムイ半島では森林植生が確認できなかった。この影響か、バラ科、キンポウゲ科、ツツジ科、スミレ科がケラムイ半島では少なかった。またケラムイ半島では淡水性の水草が比較的多く見られた。オクエゾガラガラ *Rhinanthus minor* やアキノタンポポモドキ *Leontodon autumnalis* など極東ロシアで典型的に見られる外来植物種がケラムイ半島のかく乱地で見られた。これらの種は近い将来北海道でも普通の外来種になっていくものと推定される。すでに他所で報告したが、北海道各地で見られるオニハマダイコン *Cakile edentula* が砂浜で見られた。これらは北北海道やサハリンに最近侵入した集団から、種子の海流散布により国後島に侵入したものと推定された。

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Vascular Plants Collected at Tornaya Bay, Iturup Island in 2012

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Abstract A list of 109 species in 40 families of vascular plants around Tornaya Bay, Iturup Islands was prepared based on a field survey in 2012. The biased composition of the ten dominant families at Tornaya Bay may be influenced by the local coastal meadow vegetation of the region. Forest vegetation is poor around Tornaya Bay. Among the noteworthy discoveries was *Agrimonia pilosa* Ledeb. var. *succapitata* Naruhashi.

Key words: *Agrimonia*, flora, Iturup, Tornaya Bay, vascular plants

Introduction

The flora of Iturup Island was discussed several times by Japanese botanists before the second world war (Kawakami 1901-02; Tatewaki 1941a, 1941b; Tatewaki and Yoshimura 1941; Koidzumi and Yokouchi 1956a, 1956b, 1956c, 1956d). Recently Barkalov (2000, 2002, 2009) summarized the total flora and vegetation of the Kuril Islands.

Vetrovoy Peresheyek (Rucharu-gen'ya), a plain approximately 6 km wide, and situated at the northeastern part of Iturup Island, forms a boundary between the southwestern Iturup-Kunashir District (southern Kurils) and the northeastern Urup District (Barkalov 2000, 2002). Since Tornaya Bay on Iturup Island is located on the northeastern side of the plain, it shows floristic similarities to Urup Island (see Fig. 1).

We collected vascular plants in several places around Tornaya Bay on August 28, 2012, which we here list. We also compared the flora and vegetation of Tornaya Bay with the Iturup-Kunashir District and Urup District.

Materials and Methods

Vascular plants around Tornaya Bay (Fig. 2A) were collected on August 28, 2012 at the following sites:

- A: Around Lake Sopochnoye (Fig. 2C) and low places near beach at Tornaya Bay, Iturup. N 45°19' 21", E 148°24' 44".
- B: Meadows on coastal terrace between Tornaya Bay and Senokosnaya Bay (Fig. 2D). N 45°20' 02", E 148°25' 17", alt. ca. 100m.
- C: Meadows on hill NE of Lake Sopochnoye (Fig. 2B). N 45°19' 36", E 148°25' 26", alt. ca. 100m.
- D: Disturbed wasteland at Tornaya Bay (Fig. 2B), N45°19' 40", E 148°25' 17", alt. ca. 10m.

Plants collected around Tornaya Bay are summarized in the Appendix. Data for the ten dominant families is compared with similar information from the southern and middle Kurils compiled by Barkalov (2009). Voucher specimens are deposited in the Herbarium of the Hokkaido University Museum (SAPS).

Results and Discussion

The geographic distribution of forest trees on Iturup was reported by Kawakami (1901-02). Vetrovoy Peresheyek (Rucharu-gen'ya) was regarded as a boundary between the central and northern parts of Iturup based on forest vegetation (Tatewaki and Yoshimura 1941). On the northeastern side of Vetrovoy Peresheyek, forest development is poor, and sparse forests composed of *Betula*, *Alnus*, *Salix* and so on are found only along rivers or beside lakes and wet lowlands according to the Obihiro Forestry Office (1959). Barkalov (2002, 2009) also pointed out that the *Betula ermanii* forests grow mainly in lowlands from northeastern Vetrovoy Peresheyek, Iturup, through Urup to Shimushir in the middle Kurils. We noted that herbaceous meadows formed the main vegetation around Tornaya Bay and that deciduous broad-leaved forests were limited. We could find *Betula ermanii* - *Sorbus commixta* forests only on southwestern side of Lake Sopochnoye. *Salix udensis* was the other spontaneous trees.

In total, we recorded 109 species in 40 families for Tornaya Bay region (see Appendix). Among the three dominant families, Cyperaceae, Poaceae and Asteraceae, in both the southern and middle Kurils, the Cyperaceae clearly were less important in the flora of Tornaya Bay (Table 1). The lesser importance of Cyperaceae is probably due to the regional vegetation of Tornaya Bay. The Rosaceae, Ranunculaceae, Juncaceae and Ericaceae, within the ten dominant families at Tornaya Bay, shows features in common with the southern and middle Kurils. The peculiar presence of Fabaceae, Apiaceae, and Orobanchaceae at Tornaya Bay was not reflected in the southern and middle Kurils. The peculiar composition of the dominant families shows a regional bias which is due to the nature of the coastal meadow habitats at Tornaya Bay. Based on our findings, the flora of Tornaya Bay does not show any strong evidence of similarity with the middle Kurils at the dominant family level.

Subalpine meadows composed of *Mertensia pterocarpa* and *Primula farinosa* subsp. *modesta* var. *fauriei* on coastal terraces and the occurrence of *Vaccinium vitis-idaea* and *Sorbus sambucifolia* on ridges may be due to the regional foggy climate

around Tornaya Bay.

Although we collected *Ranunculus nipponicus* var. *submersus* in a gently flowing, shallow river near its junction with the lake, we collected few water plants around Lake Sopochnoye, partly due to the limited time of our survey.

Agrimonia pilosa Ledeb. var. *succapitata* Naruhashi, which produces condensed spikes (Naruhashi and Seo 1996), is a first record from the Kuril Islands. Naruhashi and Seo (1996) reported the first occurrence of *A. pilosa* var. *succapitata* from Toyama Prefecture, central Honshu, Japan. We identified the plants of Tornaya Bay as this variety based on similarity of the inflorescence, but the shape of leaves differ somewhat from the description of the leaves given by Naruhashi and Seo (1996). More careful comparison of this collection with the Toyama plants is necessary.

The type locality of *Mertensia pterocarpa* f. *yoshimurae*, with hairs on the inner surface of the corolla tube (Fukuda and Takahashi 2002) is situated between Parusnaya Bay (Porosu) and So'fa Bay (Sokiya) on Iturup Island, which includes the present region. But as the specimens were fruiting plants, we could not confirm the forma.

Acknowledgements

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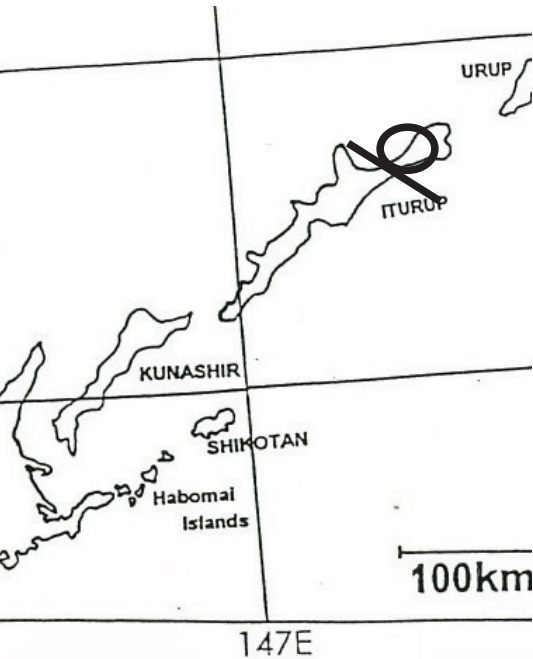


Figure 1. Location of study site. Tornaya Bay area (solid oval) and boundary (solid straight line) between Kunashir-Iturup District and Urup District.

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Table 1. A comparison of the ten dominant families in the Kurils.

Rank	S. Kurils	Rank	Tornaya Bay	Rank	M. Kurils
1	Cyperaceae (114)	1	Asteraceae (14)	1	Cyperaceae (42)
2	Poaceae (97)	2	Poaceae (10)	2	Poaceae (40)
3	Asteraceae (76)	3	Rosaceae (8)	3	Asteraceae (31)
4	Rosaceae (50)		Ranunculaceae (8)	4	Rosaceae (19)
5	Orchidaceae (42)	5	Fabaceae (6)		Ericaceae (19)
6	Ericaceae (38)		Juncaceae (6)	6	Juncaceae (16)
7	Ranunculaceae (34)		Apiaceae (6)	7	Orchidaceae (13)
8	Polygonaceae (28)	8	Orobanchaceae (5)	8	Caryophyllaceae (12)
9	Juncaceae (27)	9	Cyperaceae (3)	9	Ranunculaceae (10)
10	Lamiaceae (20)		Ericaceae (3)		Brassicaceae (10)
			Polygonaceae (3)		

The data of S. Kurils and M. Kurils follow Barkalov (2009). The number of species in parentheses.

APPENDIX.

List of vacular plants at Tornaya Bay, Iturup Island.

<Ferns and Lycophytes>

EQUISETACEAE

Equisetum arvense L. [Sugina]

A (HT & TF 35431)

Equisetum hyemale L. [Tokusa]

A (HT & TF 35441; TF 2012-512)

THELYPTERIDACEAE

Thelypteris phegopteris (L.) Sloss. ex Rydb. [Miyama-warabi]

C (HT & TF 35509)

WOODSIACEAE

Athyrium melanolepis (Franch. et Sav.) H.Christ [Miyama-meshida]

C (HT & TF 35510)

<Angiospermae>

ADOXACEAE

Sambucus racemosa L. subsp. *kamtschatica* (E.L.Wolf) Hultén [Ezo-niwatoko]

A (HT & TF 35434)

AMARYLLIDACEAE

Allium victorialis L. subsp. *platyphyllum* Hultén [Gyōjya-nin'niku]

C (HT & TF 35508)

APIACEAE

Angelica genuflexa Nutt. ex Torr. et A.Gray [Ōba-senkyū]

A (TF 2012-502)

Angelica gmelinii (DC.) Pimenow [Ezono-shishiudo]

B (HT & TF 35477)

Note: Species name follows Takahashi (2009).

Conioselinum filicinum (H. Wolff) H.Hara [Miyama-senkyū]

A (HT & TF 35451)

Glehnia littoralis F.Schmidt ex Miq. [Hama-bōhū]

A (HT & TF 35462)

Pleurospermum uralense Hoffm. [Ō-kasamochi]

C (HT & TF 35532)

Tilingia ajanensis Regel [Shirane-ninjin]

B (HT & TF 35506)

ARALIACEAE

Aralia cordata Thunb. [Udo] (Fig. 2F)

A (HT & TF 35446; TF 2012-515 deleted!)

ASPARAGACEAE

Maianthemum dilatatum (A.W.Wood) A.Nelson et J.F.Macbr. [Maizuru-sō]

C (HT & TF 35517; TF 2012-466)

ASTERACEAE

Achillea ptarmica L. subsp. *macrocephala* (Rupr.) Heimerl var. *speciosa* (DC.) Herder [Ezo-nokogiri-sō]

B (HT & TF 35486)

Anaphalis margaritacea (L.) Benth. et Hook.f. [Yama-hahako]

A (HT & TF 35429), B (HT & TF 35480; TF 2012-444)

Artemisia montana (Nakai) Pamp. [Ō-yomogi]

B (HT & TF 35474)

Chrysanthemum arcticum L. subsp. *yezoense* (Maek.) H.Ohashi et Yonek. [Chishima-kohama-giku]

C (HT & TF 35515)

Cirsium kamtschaticum Ledeb. ex DC. [Chishima-azami]

A (TF 2012-505), B (HT & TF 35475; TF 2012-441)

Gnaphalium uliginosum L. [Hime-chichiko-gusa] Naturalized!

A (HT & TF 35436, 35438; TF 2012-477)

Hieracium umbellatum L. [Yanagi-tanpopo]

B (HT & TF 35470)

Ligularia hodgsonii Hook.f. [Tōge-buki]

B (HT & TF 35466; TF 2012-437)

Parasenecio hastatus (L.) H.Koyama var. *orientalis* (Kitam.) H.Koyama [Yobusuma-sō]

A (HT & TF 35450; TF 2012-495)

Parasenecio kamtschaticus (Maxim.) Kadota var. *kamtschaticus* [Mimi-kōmori]

A (HT & TF 35433; TF 2012-508)

Picris hieracioides L. subsp. *japonica* (Thunb.) Krylov var. *japonica* (Thunb.) Regel ex Herder [Kōzori-na]

B (HT & TF 35472)

Saussurea riederii Herder subsp. *yezoensis* (Maxim.) Kitam. var. *yezoensis* Maxim. [Nagaba-kita-azami]

A (TF 2012-490), B (HT & TF 35500; TF 2012-442), C (HT & TF 35514, 35516)

Senecio cannabifolius Less. [Hangon-sō]

A (TF 2012-519)

Solidago virgaurea L. subsp. *leiocarpa* (Benth.) Hultén var. *leiocarpa* (Benth.) A.Gray [Miyama-akino-kirinsō]

B (HT & TF 35491; TF 2012-447)

BETULACEAE

Betula ermanii Cham. [Dake-kanba]

A (HT & TF 35437; TF 2012-509)

BORAGINACEAE

Mertensia pterocarpa (Turcz.) Tatew. et Ohwi [Chishima-rurisō]

B (HT & TF 35496)

BRASSICACEAE

Arabis stelleri DC. var. *japonica* (A.Gray) F.Schmidt [Hama-hatazao]

A (HT & TF 35463)

Cardamine regeliana Miq. [Ōba-tanetsuke-bana]

A (TF 2012-478)

Rorippa palustris (L.) Besser [Sukashi-ta-gobō]

A (TF 2012-503), D (HT & TF 35536)

CAMPANULACEAE

Adenophora triphylla (Thunb.) A.DC. var. *japonica* (Regel) H.Hara [Tsurigane-ninjin]

B (HT & TF 35494; TF 2012-446)

CARYOPHYLLACEAE

Sagina procumbens L. [Araitō-tsumekusa] Naturalized!

D (HT & TF 35533)

Stellaria uliginosa Murray var. *undulata* (Thunb.) Fenzl [Nomino-fusuma]

A (TF 2012-479)

CELASTRACEAE

Parnassia palustris L. var. *palustris* [Umebachī-sō]

B (HT & TF 35501; TF 2012-440)

CORNACEAE

Cornus suecica L. [Ezo-gozen-tachibana]

C (HT & TF 35518)

CRASSULACEAE

Rhodiola rosea L. [Iwa-benkei]

C (HT & TF 35530; TF 2012-465)

CYPERACEAE



Figure 2. A. Tornaya Bay. B. Camp site on meadows above bay. C. Lakeside of Sopochnoye. D. Meadows on coastal terrace between Tornaya Bay and Senokosnaya Bay. E. *Astragalus japonicus*. F. *Aralia cordata*.

Carex gmelinii Hook. et Arn. [Nemuro-suge]
B (TF 2012-438)

Carex macrocephala Willd. ex Spreng. [Ezono-kōbō-mugi]
A (HT & TF 35461) Specimens deleted!

Carex scita Maxim. var. *riishirensis* (Franch.) Kük. [Rishiri-suge]
B (HT & TF 35482, 35489))

ERICACEAE

Empetrum nigrum L. var. *japonicum* K.Koch [Gankō-ran]
C (HT & TF 35524)

Vaccinium praestans Lamb. [Iwa-tsutsuji]
C (HT & TF 35522)

Vaccinium vitis-idaea L. [Kokemomo]
C (HT & TF 35528)

FABACEAE

Astragalus japonicus H. Boissieu [Ezo-momen-zuru] (Fig. 2E)
A (HT & TF 35427; TF 2012-521)

Hedysarum hedysaroides (L.) Schinz et Thell. f. *neglectum* (Ledeb.) Ohwi [Chishima-geenge]
A (HT & TF 35456; TF 2012-489)

Lathyrus japonicus Willd. [Hama-endō]
A (TF 2012-520)

Thermopsis lupinoides (L.) Link [Sendai-hagi]

A (TF 2012-501)
Trifolium repens L. [Shiro-tsumekusa] Naturalized!
 B (HT & TF 35467)
Vicia unijuga A.Braun [Nanten-hagi]
 B (HT & TF 35479)

GENTIANACEAE
Halenia corniculata (L.) Cornaz [Hana-ikari]
 B (HT & TF 35502)
Swertia tetrapetala Pall. [Chishima-senburi]
 B (HT & TF 35487; TF 2012-436)

GERANIACEAE
Geranium erianthum DC. [Chishima-hūro]
 C (HT & TF 35519)
Geranium yezoense Franch. et Sav. [Ezo-hūro]
 B (HT & TF 35493; TF 2012-449)

HYPERICACEAE
Hypericum erectum Thunb. [Otogiri-sō]
 A (TF 2012-483), B (HT & TF 35499)

JUNCACEAE
Juncus bufonius L. [Hime-kōgai-zekishō]
 A (HT & TF 35432)
Juncus covillei Piper [Sekishō-i]
 A (HT & TF 35423)
Juncus decipiens (Buchenau) Nakai [Igusa]
 A (HT & TF 35443; TF 2012-480)
Juncus krameri Franch. et Sav. [Tachi-kōgai-zekishō]
 D (HT & TF 35538)
Juncus tenuis Willd. [Kusa-i] Naturalized!
 D (HT & TF 35537)
Luzula capitata (Miq.) Miq. ex Kom. [Suzumeno-yari]
 B (HT & TF 35503), C (HT & TF 35520)

LAMIACEAE
Prunella vulgaris L. subsp. *asiatica* (Nakai) H.Hara [Utsubo-gusa]
 B (HT & TF 35473)
Scutellaria yezoensis Kudō [Ezo-namiki]
 A (HT & TF 35459)

LILIACEAE
Lilium medeoloides A.Gray [Kuruma-yuri]
 C (HT & TF 35531)

ORCHIDACEAE
Dactylorhiza aristata (Fisch. ex Lindl.) Soó f. *punctata* (Tatew.) F.Maek. ex Toyok. [Uzuraba-hakusan-chidori]
 C (HT & TF 35521)

OROBANCHACEAE
Euphrasia mollis (Ledeb.) Wettst. [Chishima-kogome-gusa]
 A (TF 2012-482), B (HT & TF 35504)
Euphrasia maximowiczii Wettst. var. *yezoensis* (H.Hara) H.Hara ex T.Yamaz. [Ezo-kogome-gusa]
 A (HT & TF 35453; TF 2012-518)
Pedicularis chamissonis Steven subsp. *chamissonis* [Kita-yotsuba-shiogama]
 B (HT & TF 35495)
Pedicularis resupinata L. subsp. *teucrifolia* (M.Bieb. ex Steven) T.Yamaz. [Birōdo-shiogama]
 A (HT & TF 35430; TF 2012-492), B (HT & TF 35465; TF 2012-451)
Rhinanthus minor L. [Okuezo-garagara] Alien!
 A (TF 2012-497), B (HT & TF 35505; TF 2012-450)

PLANTAGINACEAE

Plantago asiatica L. [Ōbako]
 B (HT & TF 35470)

POACEAE

Agrostis flaccida Hack. [Miyama-nukabo]
 B (HT & TF 35476), C (HT & TF 35525)
Agrostis gigantea Roth [Konuka-gusa] Naturalized
 A (HT & TF 35425, 35458; TF 2012-517)
Agrostis scabra Willd. [Ezo-nukabo]
 D (HT & TF 35534)
Calamagrostis purpurea (Trin.) Trin. subsp. *langsдорffii* (Link) Tzvelev [Iwa-no-gariyasu]
 A (HT & TF 35452, 35455), B (HT & TF 35488), C (TF 2012-475)
Deschampsia cespitosa (L.) P.Beauv. subsp. *orientalis* Hultén var. *festucifolia* Honda [Hirohano-kome-susuki]
 B (HT & TF 35481)
Festuca ovina L. [Ushinoke-gusa]
 D (HT & TF 35535)
Phalaris arundinacea L. [Kusa-yoshi] Naturalized!
 A (HT & TF 35458)
Phleum pratense L. [Ō-awagaeri] Naturalized!
 A (HT & TF 35464)
Poa pratensis L. [Nagaha-gusa] Naturalized!
 A (HT & TF 35424, 35449)
Sasa kurilensis (Rupr.) Makino et Shibata [Chishima-zasa]
 A (HT & TF 35445)

POLYGONACEAE

Bistorta vivipara (L.) Delarbre [Mukago-toranoo]
 C (HT & TF 35526)
Rumex acetosella L. [Hime-suiba] Naturalized!
 A (HT & TF 35448, 35460; TF 2012-481)
Rumex obtusifolius L. [Ezono-gishigishi]
 A (HT & TF 35447)

PRIMULACEAE

Primula farinosa L. subsp. *modesta* (Bisset et S.Moore) Pax var. *fauriei* (Franch.) Miyabe [Yukiwari-kozakura]
 B (HT & TF 35485; TF 2012-422)

RANUNCULACEAE

Aconitum maximum Pall. ex DC. subsp. *maximum* [Chishima-torikabuto]
 B (HT & TF)
Anemone narcissiflora L. var. *villosissima* (DC.) Hultén [Senka-sō]
 C (HT & TF 35527)
Note: This scientific name follows Ziman et al. (2005).
Cimicifuga simplex (DC.) Wormsk. ex Turcz. [Sarashina-shōma]
 C (HT & TF 35512)
Ranunculus grandis Honda var. *austrokurilensis* (Tatew.) H.Hara [Shikotan-kinpōge]
 B (HT & TF 35468)
Ranunculus nipponicus Nakai var. *submersus* H.Hara [Baika-mo]
 A (HT & TF 35426)
Ranunculus repens L. [Hai-kinpōge]
 A (HT & TF 35444)
Thalictrum minus L. var. *hypoleucum* (Siebold et Zucc.) Miq. [Aki-karamatsu]
 B (HT & TF 35490; TF 2012-439)
Trollius riederianus Fisch. et C.A.Mey. [Chishimano-kinbaisō]
 B (HT & TF 35483)

ROSACEAE

Agrimonia pilosa Ledeb. var. *succapitata* Naruhashi [Daruma-kin-mizuhiki]

A (HT & TF 35428; TF 2012-493)

Aruncus dioicus (Walter) Fernald var. *kamtschaticus* (Maxim.) H.Hara [Yamabuki-shōma]

B (HT & TF 35478)

Cerasus nipponica (Matsum.) Ohle ex H.Ohba var. *kurilensis* (Miyabe) H.Ohba [Chishima-zakura]

C (HT & TF 35511)

Filipendula camtschatica (Pall.) Maxim. [Oni-shimotsuke]

A (HT & TF 35454; TF 2012-516)

Potentilla stolonifera Lehm. ex Ledeb. [Tsuru-kijimushiro]

B (HT & TF 35498; TF 2012-443)

Sanguisorba tenuifolia Fisch. ex Link var. *tenuifolia* [Nagabono-waremokō]

B (HT & TF 35484; TF 2012-445)

Sorbus commixta Hedl. [Nana-kamado]

A (TF 2012-511), C (HT & TF 35513)

Sorbus sambucifolia (Cham. et Schltdl.) M.Roem. [Takane-nana-kamado]

C (HT & TF 35529)

RUBIACEAE

Galium trifidum L. subsp. *columbianum* (Rydb.) Hultén [Hosobano-yotsuba-mugura]

A (HT & TF 35439; TF 2012-498)

Galium verum L. subsp. *asiaticum* (Nakai) T.Yamaz var. *trachycarpum* DC. [Ezono-kawara-matsuba]

B (HT & TF 35497)

SALICACEAE

Salix udensis Trautv. et C.A.Mey. [Onoe-yanagi]

A (HT & TF 35435, 35442; TF 2012-507, 2012-510, 2012-514)

SAXIFRAGACEAE

Saxifraga fusca Maxim. subsp. *fusca* var. *kurilensis* Ohwi [Chishima-kurokumo-sō]

A (TF 2012-476)

URTICACEAE

Urtica platyphylla Wedd. [Ezo-irakusa]

A (TF 2012-506, 2012-513)

VIOLACEAE

Viola langsdorfii Fisch. ex DC. subsp. *sachalinensis* W.Becker [Ōba-tachitsubo-sumire]

C (HT & TF 35507)

XANTHORRHOACEAE

Hemerocallis dumortierii C.Morren var. *esculenta* (Koidz.) Kitam. [Zenteika]

B (HT & TF 35492)

科、セリ科、ハマウツボ科が主要 10 科に入る点で、南千島地域や中千島地域の主要科構成とは異なっていた。この違いは植物地理学的な異同というよりは、地域的な立地環境の違いを反映しているものと解釈された。また本州富山県から報告されているダルマキンミズヒキに酷似する植物を採集したが、さらに分類学的な検討を行う必要がある。

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高橋英樹¹, 福田知子²: 2012 年野外調査において択捉島塘路で採集された維管束植物

2012 年の野外調査において、択捉島塘路周辺で 40 科 109 種の維管束植物を採集した。塘路は Barkalov (2000, 2002, 2009) によると択捉島内でありながら、植物地理学的には国後・択捉地区よりもむしろウルップ地区に含まれるとされ、植生の上でも中千島に似ているとされる。そこで所産する主要 10 科を Barkalov (2009) による南千島地域、中千島地域のそれと比較した。科構成は特にどちらかの地域により似ているということとはなかった。むしろ塘路周辺ではマメ

Inocybe (Agaricales, Inocybaceae) Collected in the Islands of Iturup and Kunashir

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Abstract This paper considers four species of *Inocybe* occurring in Iturup or Kunashir as new records: (1) *Inocybe maculipes* (Section *Tardae*) has smooth basidiospores and caulocystidia at stipe apex; (2) *Inocybe splendens* var. *splendens* (Section *Splendentes*) has smooth spores and caulocystidia throughout; (3) *Inocybe taxocystis* (Section *Inocybe*) has nodulose spores and caulocystidia at stipe apex; and (4) *Inocybe intricata* var. *pallidistipata* (Section *Marginatae*) has nodulose spores and caulocystidia throughout.

Key words: Basidiomycetes, *Inocibium*, *Inocybe*, Systematics

Introduction

The genus *Inocybe* consists of a large number of species. In northern island of Japan, Hokkaido, Imai (1938) reported several taxa of *Inocybe*.

During taxonomic studies on the genus *Inocybe*, the authors encountered various apparently hitherto unknown taxa. Several of these have been reported from Hokkaido, Japan by the senior author (Kobayashi 1993, 2002a,b, 2003, 2009 ; Obase et al. 2006).

The mycobiota of *Inocybe* in Iturup and Kunashir Islands where are near to Hokkaido, are almost unknown except Kobayashi (2013). Four new records from Iturup or Kunashir Islands are given.

Materials and Methods

The specimens cited in this paper are deposited in the herbarium of the Hokkaido University Museum, Sapporo (SAPA). In the following descriptions, color names or notations cited in double quotation marks are those of the Royal Botanic Garden, Edinburgh (1969). Dried specimens were rehydrated in 10% NH₄OH and microscopically examined. For the length measurements on the apiculus and sterigmata were excluded in the case of basidiospores and basidia, respectively. Sections of the central area of the pileus were cut along the surface, through the pileipellis.

Taxonomy

Inocybe maculipes J. Favre, Rés. Rech. scient. entrepr. Parc Nat. suisse 5(33): 201. 1955. Fig.1

Pileus 29-41 mm broad, convex to hemispherical, umbonate, with white velipellis on umbo, surface smooth, rimulose at margin, satiny, “fulvous” to “bay”. Lamellae adnexed, subdistant,

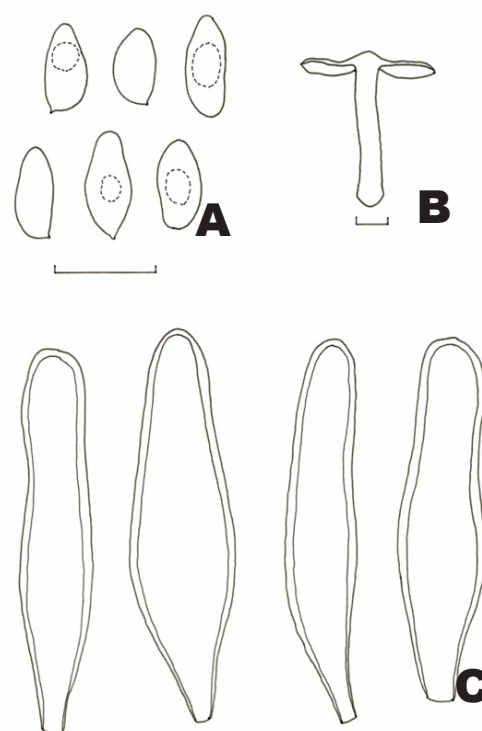


Figure 1. *Inocybe maculipes*. A. Basidiospores. B. Section of basidiocarp. C. Pleurocystidia. Scale bars: A: 10 μ m, B: 10 mm., C: 20 μ m.

with fimbriate white edges, “umber”. Stipe < 33 $\times$ 4.0-8.5 mm, somewhat swollen toward base (< 10.5 mm), satiny, striate, pruinose at the apex, solid, “white” to slightly yellow “e”. Context in pileus thin, white “b”, in stipe striate, strongly satiny, white “b”. Odor strong, fish-like, unpleasant. Taste grassy.

Basidiospores 8.3-11.0 $\times$ 4.5-5.5 μ m (average value 9.4 $\times$ 5.0 μ m), Q = 1.6-2.1 (average value 1.9), subamygdaliform, phaseoliform, with subconical apex. Basidia 28-35 $\times$ 7.5-9.5 μ m,

4-spored, cylindrical to clavate, thin-walled, almost colorless to very pale yellow. Pleurocystidia $54\text{--}78 \times 13.8\text{--}25.8\ \mu\text{m}$, cylindrical to fusiform, thick-walled ($< 2.0\ \mu\text{m}$), very pale yellow, with usually colorless intracellular contents. Cheilocystidia similar to pleurocystidia, thick-walled. Paracystidia present along with cheilocystidia, often catenate with terminal cells cylindrical, thin-walled, almost colorless to yellow. Hymenophoral trama subregular; hyphae $7.0\text{--}10.0\ \mu\text{m}$ diam, sometimes swollen ($< 20.0\ \mu\text{m}$), almost colorless to yellow. Caulocystidia present at the apex only, similar to pleurocystidia, sublageniform, thick-walled. Cauloparacystidia present along with caulocystidia, similar to paracystidia. Pileipellis a subregularly arrayed cutis, duplex; the upper layer $< 65\ \mu\text{m}$ thick, with hyphae $3.8\text{--}6.3\ \mu\text{m}$ diam and agglutinating at the surface, almost colorless; the subtending layer $< 43\ \mu\text{m}$ thick, with hyphae $5.0\text{--}11.3\ \mu\text{m}$ diam, rusty brown. Clamp connections abundant in all tissues, but not at all septa.

Collection examined: Iturup, Shana, in *Larix gmelinii* var. *japonica* and *Betula ermanii* forest, 30 Aug. 2012, leg. K. Kawai, TAKK 12.8.30.1 in SAPA.

Japanese name: Kawai-tomaya-take (Takahito Kobayashi).

This species belongs to the subgenus *Inocybium* (Earle) Singer, section *Tardae* Bon, because it possesses metuloid caulocystidia only at the apex, and subamygdaliform basidiospores.

Present collection coincides well with *I. maculipes* reported by Favre (1955) and Kuyper (1986) from Switzerland, although the latter lacks caulocystidia at stipe apex (Kuyper 1986).

Inocybe maculipes is close to *I. ovoidea* Takah. Kobay. from Hokkaido, Japan (Kobayashi 2003), but the latter is different from the former in having larger basidiocarps, narrow metuloids and longer spores.

Inocybe splendens R. Heim, Genre *Inocybe*: 328. 1931 var. *splendens*. Figs. 2, 3

Pileus 27 mm broad, when young hemispherical with involved margin, umbonate, surface smooth, rimulose to rimose, “sinnamon”, on umbo “snuff brown”. Lamellae sinuate to free, close, with fimbriate white edges, brown. Stipe $29 \times 7.0\ \text{mm}$, equal above a marginately bulbous base ($< 10.5\ \text{mm}$ broad), naked, striate, pruinose wholly, solid, white “b”. Context in pileus thin, pure white, in stipe striate, strongly satiny, white “b”. Odor strong, spermatic. Taste indistinct, grassy.

Chemical reactions. *Pileus*: $\text{FeCl}_3 \cdot 6\text{H}_2\text{O}$ (20%) olive within 1 min. *Lamellae*: $\text{FeCl}_3 \cdot 6\text{H}_2\text{O}$ (20%) gradually pale olive within 15 min. *Stipe*: $\text{FeCl}_3 \cdot 6\text{H}_2\text{O}$ (20%) negative.

Basidiospores $7.3\text{--}10.1 \times 4.5\text{--}5.8\ \mu\text{m}$ (average value $8.7 \times 5.2\ \mu\text{m}$), $Q = 1.5\text{--}2.1$ (average value 1.7), oblong to subamygdaliform. Basidia $31\text{--}34 \times 8.3\text{--}9.5\ \mu\text{m}$, 4-spored, clavate, thin-walled, pale lemon. Pleurocystidia $58\text{--}83 \times 10.8\text{--}18.8\ \mu\text{m}$, ventricose to fusiform, thick-walled ($< 1.8\ \mu\text{m}$), very pale yellow, with colorless intracellular contents. Cheilocystidia similar to pleurocystidia, thick-walled. Paracystidia present along with cheilocystidia, often catenate with terminal cells $23\text{--}29 \times 5.8\text{--}7.5\ \mu\text{m}$, broadly clavate to narrowly cylindrical, thin-walled, very pale yellow to yellow. Hymenophoral trama subregular; hyphae $5.0\text{--}8.8\ \mu\text{m}$ diam, almost colorless. Caulocystidia descending to base, similar



Figure 2. Basidiocarp of *Inocybe splendens* var. *splendens*. Scale bar: 10 mm.

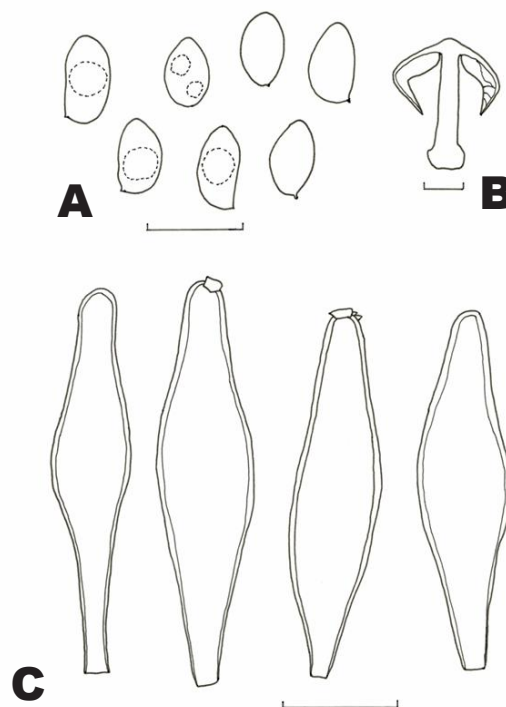


Figure 3. *Inocybe splendens* var. *splendens*. A. Basidiospores. B. Section of basidiocarp. C. Pleurocystidia. Scale bars: A: $10\ \mu\text{m}$, B: 10 mm., C: $20\ \mu\text{m}$.

to pleurocystidia, thick-walled. Cauloparacystidia present along with caulocystidia, similar to paracystidia, thin-walled. Pileipellis a subregularly arrayed cutis, duplex; the upper layer < 95 µm thick, with hyphae 3.3-10.0 µm diam and agglutinating at the surface, almost colorless; the subtending layer < 48 µm thick, with hyphae 4.5-11.3 µm diam, brown. Clamp connections present.

Collections examined: Iturup, Shana to Rubetsu, in *Quercus crispula* forest, 6 Sep. 2012, leg. Takah. Kobayashi, TAKK 12.9.6.2-1 in SAPA & TAKK 12.9.6.2-2 in SAPA.

Japanese name: Kōtaku-tomaya-take (Takahito Kobayashi).

This species belongs to the subgenus *Inocibium* (Earle) Singer, section *Splendentes* Singer, since it possesses thick-walled caulocystidia throughout, and smooth spores.

Present collection coincides well with *I. splendens* var. *splendens* reported by Heim (1931), Kuyper (1986) and Stangl (1989) from Europe.

Inocybe splendens has been proposed by Heim (1931), recently it is kept by the revision of Kropp et al. (2010).

Inocybe taxocystis (J. Favre) R. Singer, *The Agaricales in Modern Taxonomy* ed. 4: 604. 1986. Figs. 4, 5

≡ *Inocybe decipientoides* Peck var. *taxocystis* J. Favre, Rés. Rech. scient. entrepr. Parc Nat. suisse 5(33): 202. 1955.

≡ *Astrosporina taxocystis* Favre & E. Horak in E. Horak, in Laursen, Ammirati & Redhead (ed.) *Arctic and Alpine*

Mycology 2: 230. 1987.

≡ *Inocybe taxocystis* (Favre) Stangl, *Hoppea* 46: 29. 1989.

≡ *Inocybe taxocystis* (Favre & E. Horak) B. Senn-Irlet, *Botanica Helvetica* 102: 55. 1992.

Pileus 9-16 mm broad, convex, umbonate, surface smooth, rimulose at margin, “date brown”, on umbo “fulvous”. Lamellae sinuate to adnexed, close, with fimbriate white edges, brown. Stipe 22-33 × 2.0-3.0 mm, equal above a marginately bulbous base (< 5.5 mm broad), surface fibrillose, pruinose at the apex only, solid, “fawn” upward dull white “c” at lower part. Context in pileus thin, pure white, in stipe striate, satiny, cream “d”. Odor strong, as butter-like almond. Taste none.

Chemical reactions. *Pileus*: FeCl₃ • 6H₂O (20%) gradually dark olive within 10 min. *Lamellae*: FeCl₃ • 6H₂O (20%) darkening immediately. *Stipe*: FeCl₃ • 6H₂O (20%) gradually olive within 10 min.

Basidiospores 7.0-9.8 × 5.0-7.0 µm (average value 8.1 × 6.1 µm), Q = 1.1-1.6 (average value 1.3), weakly nodulose. Basidia 24-28 × 7.0-11.3 µm, 4-spored, narrowly clavate to broadly clavate, thin-walled, almost colorless to very pale yellow. Pleurocystidia 44-60 × 14.5-17.0 µm, ventricose to fusiform, thick-walled (< 3.3 µm), very pale yellow, with usually colorless intracellular contents. Cheilocystidia similar to pleurocystidia, but with somewhat thicker walls and broader. Paracystidia present along with cheilocystidia, often catenate with terminal cells broadly clavate, thin-walled, with slightly yellowish-brown intercellular contents. Hymenophoral trama subregular; hyphae 3.8-11.3 µm diam, sometimes swollen (< 18.8 µm), almost colorless. Caulocystidia present at the apex only, similar to pleurocystidia but occasionally narrower, thick-walled. Cauloparacystidia present along with caulocystidia, similar to



Figure 4.
Basidiocarps of *Inocybe taxocystis*. Scale bar: 10 mm.

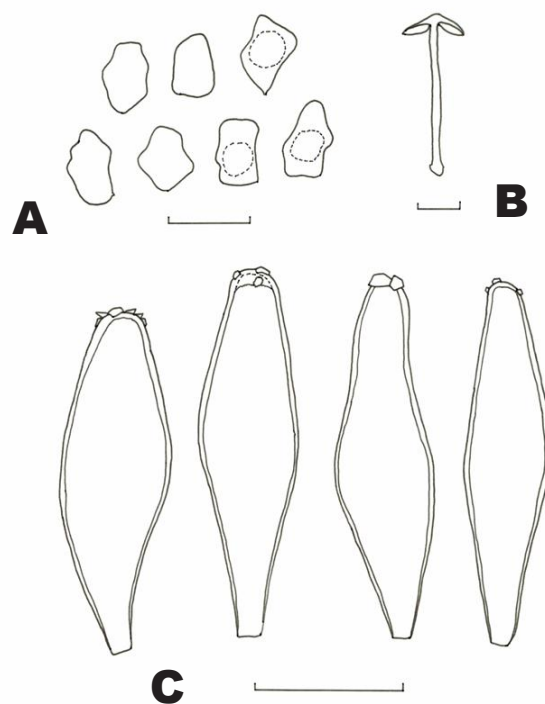


Figure 5.
Inocybe taxocystis. A. Basidiospores. B. Section of basidiocarp. C. Pleurocystidia. Scale bars: A: 10 µm, B: 10 mm., C: 20 µm.

paracystidia. Pileipellis a cutis, simple, the layer < 165 µm thick, with subregular hyphae 4.5-8.3 µm diam and weakly agglutinating at the surface, yellowish brown. Clamp connections abundant in all tissues, but not at all septa.

Collections examined: Iturup, Bettobu, in *Betula ermanii* forest, 30 Aug. 2012, leg. Takah. Kobayashi, TAKK 12.9.1.1 in SAPA & TAKK 12.9.1.2 in SAPA.

Japanese name: Yubari-tomaya-take (Takahito Kobayashi).

This species belongs to the subgenus *Inocybe* [= *Clypeus* Britzelm.] section *Inocybe* [= *Cortinatae* Kühner & Boursier], since it has thick-walled caulocystidia at the apex only, and nodulose spores.

Present collection coincides well with *I. decipientoides* var. *taxocystis* reported by Favre (1955) from Switzerland, although the latter possesses longer basidiospore. Also, Horark (1987) described that *Astrosporina taxocystis* as having longer basidiospores. However, intermediate basidiospore characters were shown by Kobayashi et al. (1971) from Greenland, Kobayashi (2002a) in Hokkaido, Japan and Solak et al. (2014) in Deliosman, Turkey. Ferrari (2006) drew *Inocybe taxocystis* as having short basidiospores which are similar to present collection.

Inocybe taxocystis is close to *I. napiformis* Takah. Kobay. from Hokkaido, Japan (Kobayashi 2009), but the latter has a napiform-bulbous base of stipe, thicker pleurocystidia, narrow-type cheilocystidia, and a trichoderm cuticle.

***Inocybe intricata* Peck var. *pallidistipata* Grund & Stuntz,**
Mycologia 75: 261. 1983. Figs. 6, 7

Pileus 13-20 mm broad, convex, subumbonate, surface with fine, appressed-longitudinal scales, rimulose to rimose, satiny, rusty yellow to “fulvous”, on umbo “cinnamon”. Lamellae adnate, adnexed to sinuate, close, with fimbriate to serrate white edges, grayish brown, “cinnamon” to “snuff brown”. Stipe 24-32 × < 3.0 mm, equal above a marginately bulbous base (< 6.0 mm broad), striate, pruinose wholly, solid, cream to slightly yellow “e”. Context in pileus thin, white “b”, in stipe striate, satiny, white “d”, “pink clay” to “peach” near the surface. Odor weak, grassy to salty. Taste none.

Chemical reactions. *Pileus*: FeCl₃ • 6H₂O (20%) gradually dark olive within 15 min. *Lamellae*: FeCl₃ • 6H₂O (20%) olive immediately. *Stipe*: FeCl₃ • 6H₂O (20%) with green tings within 15 min.

Basidiospores 9.5-12.0 × 7.0-10.8 µm (range of average value 10.5-11.0 × 8.5-9.2 µm), Q = 1.1-1.5 (average value 1.2), prominently nodulose. Basidia 24-33 × 9.5-14.5 µm, 4-spored, narrowly clavate, thin-walled, pale lemon. Pleurocystidia 61-78 × 14.5-19.5 µm, cylindrical to fusiform, thick-walled (< 4.5 µm), very pale yellow, with usually colorless intracellular contents. Cheilocystidia similar to pleurocystidia, thick-walled. Paracystidia present along with cheilocystidia, often catenate with terminal cells < 24 × 13.8 µm, broadly clavate to spherical, thin-walled, almost colorless. Hymenophoral trama subregular to regular; hyphae 3.8-8.3 µm diam, sometimes swollen (< 15.0 µm), filled with slightly yellow contents. Caulocystidia descending to base, similar to



Figure 6.
Basidiocarp of *Inocybe intricata* var. *pallidistipata*. Scale bar: 10 mm.

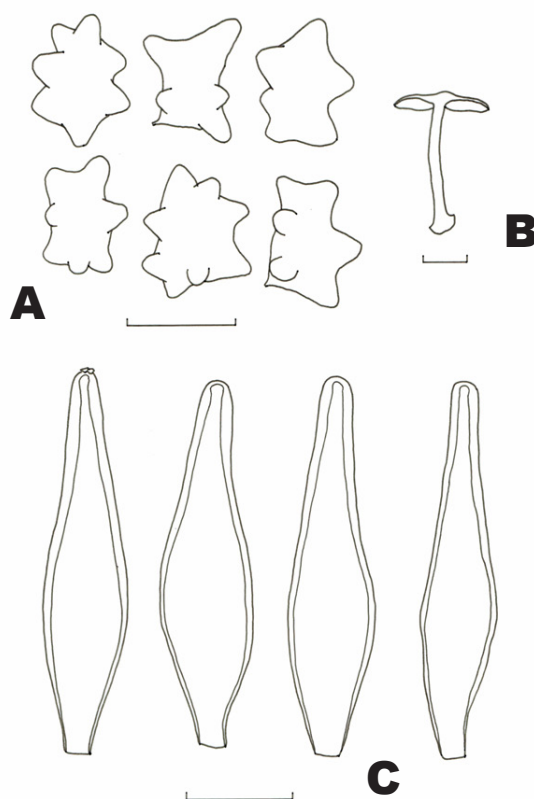


Figure 7.
Inocybe intricata var. *pallidistipata*. A. Basidiospores. B. Section of basidiocarp. C. Pleurocystidia. Scale bars: A: 10 µm, B: 10 mm., C: 20 µm.

pleurocystidia, fusiform to broadly ventricose with a cylindrical neck, thick-walled. Cauloparacystidia present along with caulocystidia, similar to paracystidia. Pileipellis a subregularly arrayed cutis, duplex; the upper layer < 70 µm thick, with hyphae 3.3–8.8 µm diam and agglutinating at the surface, almost colorless to slightly gray; the subtending layer < 40 µm thick, with hyphae 6.3–10.8 µm diam, rusty brown. Clamp connections present.

Collections examined: Kunashir, near the river Andreevka, in *Alnus* forest, 20 Aug. 2012, leg. Takah. Kobayashi & A. Bobyr, TAKK 12.8.20.1-1 in SAPA, TAKK 12.8.20.1-2 in SAPA, TAKK 12.8.20.2 in SAPA & TAKK 12.8.20.4 in SAPA.

Japanese name: Kunashir-tomaya-take (Takahito Kobayashi).

Inocybe intricata var. *pallidistipata* belongs to the subgenus *Inocybe* [= *Clypeus* Britzelm.], section *Marginatae* Kühner, since it possesses thick-walled caulocystidia throughout, and nodulose spores.

Present collection coincides well with *I. intricata* var. *pallidistipata* reported by Grund and Stuntz (1983) from Washington, although the latter was described as having polyhedral spores (Grund and Stuntz 1983).

Inocybe vulpina Takah. Kobay. from central Honshu, Japan (Kobayashi 2002a) is close to *I. intricata* var. *pallidistipata*, but the latter is different from the former in having square nodules of spores, thinner pleurocystidia and caulocystidia only apex (Kobayashi 2002a).

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- 小林孝人・寺嶋芳江：北方四島で採集されたアセタケ属（ハラタケ目、アセタケ科）菌について
本報告においては、2012年に国後・択捉島で採集した、北方四島から未報告のアセタケ属菌4種を載録した。
(1) *Inocybe maculipes* J. Favre カワイトマヤタケ（小林孝人）
Section *Tardae* コウキトマヤタケ節に所属する。平滑な担子胞子を持ち、側シスチジアは厚壁。柄シスチジアが柄の頂部にのみ存在する。
(2) *Inocybe splendens* R. Heim var. *splendens* コウタクトマヤタケ（小林孝人）
Section *Splendentes* コウタクトマヤタケ節に所属する。平滑な担子胞子を持ち、側シスチジアは厚壁。柄シスチジアが柄の全面に存在する。
(3) *Inocybe taxocystis* (J. Favre) R. Singer ユウバリトマヤタケ（小林孝人）
Section *Inocybe* [= *Cortinatae*] クロニセトマヤタケ節に所属する。コブがある担子胞子を持ち、側シスチジアは厚壁。柄シスチジアが柄の頂部にのみ存在する。
(4) *Inocybe intricata* Peck var. *pallidistipata* Grund & Stuntz クナシルトマヤタケ（小林孝人）
Section *Marginatae* カブラアセタケ節に所属する。コブがある担子胞子を持ち、側シスチジアは厚壁。柄シスチジアが柄の全面に存在する。
(琉球大学熱帯生物圏研究センター西表研究施設)

Bats from Kunashir and Iturup Islands

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Abstract Recent extensive bat surveys between 2010 and 2013 in Kunashir Island and the middle part of Iturup Island have brought about new important contributions on the bat fauna in islands. In Kunashir Island, we found 7 of the 8 species (*Barbastella leucomelas*, *Plecotus sacrimontis*, *Myotis gracilis*, *My. ikonnikovi*, *My. macrodactylus*, *My. petax* and *Murina ussuriensis*), which were previously reported, and 2 additional species (*Eptesicus nilssonii* and *Myotis nattereri*), which has been not reported. In the middle part of Iturup Island, we found all of the 4 species (*Eptesicus nilssonii*, *Plecotus sacrimontis*, *Myotis gracilis* and *My. petax*), which were previously reported. Our surveys show that Kunashir Island harbors at least 6 bat species more than Iturup Island.

Key words: bat, Chiroptera, fauna, Iturup Island, Kunashir Island

Introduction

Kunashir and Iturup islands are located east off Hokkaido. It has been known that the flora and fauna in these islands is different from each other. Kunashir Island has an area of approx. 1,499 square kilometers. The shortest distance between Hokkaido and Kunashir is 16 km. Terrestrial mammals in the island, including introduced species, had been reported as 15 to 16 species (*Sorex unguiculatus*, *S. gracillimus*, *S. caecutiens*, *S. minutissimus*, *Lepus timidus*, *Apodemus speciosus*, *Mus musculus*, *Rattus norvegicus*, *Myodes sikotanensis* (*M. rex*), *Vulpes vulpes*, *Ursus arctos*, *Martes zibellina*, *Mustela erminea*, *Mustela nivalis*, *Mustela lutreola*, *Tamias sibiricus*) and 8 bat species (Kostenko et al. 2004, Oshida 2009). Iturup Island is located northeast of Kunashir Island, being separated by a 22 km wide channel. This island has an area of approx. 3,184 square kilometers and the length of the island is 203 km. Terrestrial mammals including introduced species in the island have been reported to be 8 species (*Lepus timidus*, *Mus musculus*, *Rattus norvegicus*, *Myodes rufocanus*, *Vulpes vulpes*, *Ursus arctos*, *Martes zibellina*, *Mustela lutreola*), and 4 bat species (Kostenko et al. 2004).

Bat surveys in eastern part of the Hokkaido has been conducted extensively, and 15 species from east Hokkaido have been reported (Sano et al. 2009; Kondo 2013). On Kunashir and Iturup islands, bat surveys in had been conducted several times by Russian researchers (Tiunov 1997; Selezneva and Tiunov 2007). These

authors have documented 8 species (*Barbastella darjelingensis*, *Plecotus sacrimontis*, *Myotis gracilis*, *My. ikonnikovi*, *My. macrodactylus*, *My. petax*, *Murina hilgendorfi* and *Mu. ussuriensis*) from Kunashir Island (Tiunov 1997; Selezneva and Tiunov 2007), and 4 species (*Eptesicus nilssonii*, *Plecotus sacrimontis*, *Myotis gracilis* and *My. petax*) from Iturup Island (Tiunov 1997). However, bat surveys on these islands had been insufficient and can not explain their bat fauna.

In this paper, we report recently published (Kawai et al. 2011, 2013; Kondo et al. 2011, 2013) and unpublished bats' capture records in Kunashir Island and the middle part of Iturup Island from 2010 to 2013.

Methods

We surveyed bats in Kunashir and Iturup islands from 2010 to 2013 during the summer season. Bats were captured by mist nets (5-9m width, 3-5m high; Sagami Gyomou, Tokyo) or harp traps (Austbat two bank; Faunatech, Australia) when active outside their roosts. Mist nets or harp traps were set on forest trails or roads, inside forests or on the surface of water bodies for two to three hours from sunset. Bats were captured in their roost with a hand-net.

Captured bats were identified to species based on Sano et al. (2009), and sex, age, maturity and reproductive status were noted. Age categories were defined as; "juvenile": from first flight to the

end of their year of birth; “adult”: beginning after their first year following birth. Age was determined from the degree of epiphyseal fusion (ossification of the finger bones; Mitchell-Jones and McLeish, 1999) or reproductive status. Body weight and forearm length were measured using a digital balance (Custom, Japan) and a slide caliper (Mitutoyo Corporation, NTD12 15PMX), respectively. For individual identification, numbered aluminum bands (Lambournes Ltd., U. K.) were placed on the forearm before release. Skin and skull specimens were prepared, and external and cranial morphology was measured from these.

Results and Discussions

We recorded a total of 695 individuals comprising 9 bat species at 22 sites in the Kunashir and Iturup Islands (Table 1, 2; Fig. 1).

1. Northern bat

Eptesicus nilssonii (Keyserling & Blasius, 1839)

This species are usually treated as the genus “*Amblyotus*” by Russian taxonomist (Tiunov 1997). This species has been recorded in Hokkaido, except for the southern part of the island (Fukui 2009a). It had been known from Iturup Island but not from Kunashir Island (Tiunov 1997).

A total of 2 male bats were captured at site 1 in Kunashir Island and site 14 in Iturup Island in our survey. This is the first record in Kunashir Island, and second record in the Iturup Island. The sizes of the individuals were not remarkably different from those from Hokkaido.

E. nilssonii is known to forage above the forest canopy. We saw several individuals of a middle-sized bat flying above the forest

canopy in Kunashir and Iturup islands. It could be this species, however, we could not capture any of these high-flying bats. We supposed that the abundance of the species is not low.

2. Eastern barbastelle

Barbastella leucomelas (Cretzschmar, 1826)

This species has been recorded from central to eastern Hokkaido, and from limited areas in Honshu and Shikoku. The first record of this species is in Kunashir Island in 2007 (Selezneva and Tiunov 2007). However, it has not been known from Shikotan and Iturup Island.

The Asian barbastelle have been traditionally considered to be the same as “*B. leucomelas*”. However, several researchers have pointed out that the Asian barbastelle is dramatically different from the latter species in morphometry of the skull, its genetics, and have considered “*B. leucomelas*” as endemic to Sinai and Israel (Benda et al., 2008). Researchers have also suggested that the Japanese population and/or “island populations” around Hokkaido should be treated as *Barbastella darjelingensis* Dobson (1875) (Tiunov 2011; Kruskop 2012). In this report, we followed Sano et al. (2009), and use “*Barbastella leucomelas*” for the Island population.

We recorded one male at site 6 in Kunashir Island (Table 2). This is the second record in the island. The size of this individual (Table 3 and Table 5) is not remarkably different from those of Hokkaido.

3. Japanese long-eared bat

Plecotus sacrimontis Allen, 1908

This species has been recorded from a wide altitudinal range thorough out Hokkaido (Fukui 2009b), and from north part of

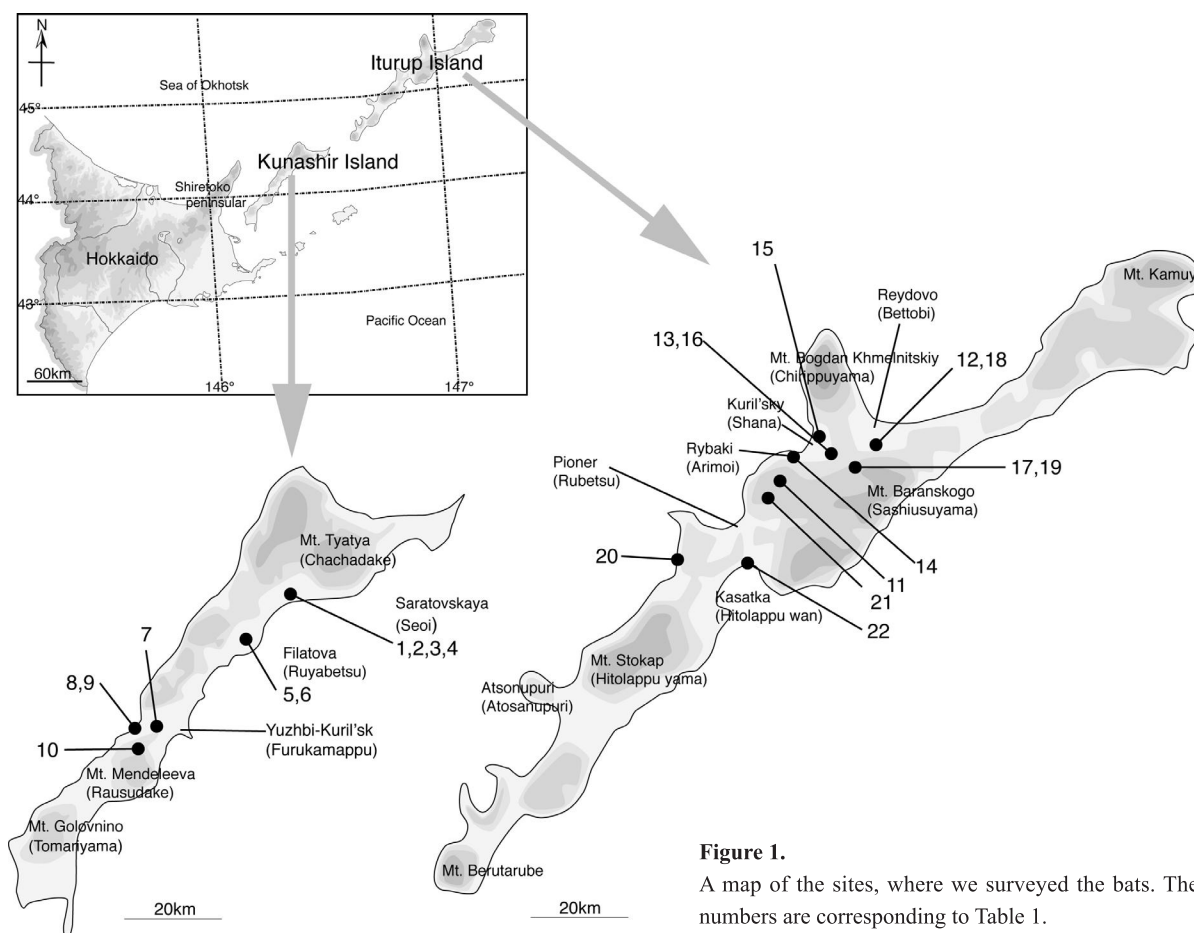


Figure 1.

A map of the sites, where we surveyed the bats. The numbers are corresponding to Table 1.

Table 1. List of capture sites in Kunashir Island and the middle part of Iturup Island.

	Locality number		Latitude	Longitude
Kunashir Is.	1	Around the ranger hut in Saratovskaya (Seoi)	44.266 N	146.107 E
	2	Branch of the Saratovskaya (Seoi) River	44.263 N	146.104 E
	3	Junction with the Saratovskaya (Seoi) River	44.270 N	146.103 E
	4	Around the ranger hut in Saratovskaya (Seoi)	44.266 N	146.106 E
	5	Branch of Filatova (Ruyabetsu) River	44.194 N	146.020 E
	6	Around the ranger hut in Filatova (Ruyabetsu)	44.194 N	146.020 E
	7	Forest road to Serebryanoye (Furukamappu) Lake	44.043 N	145.802 E
	8	Lagunnoye (Nikishoro) Sea Cave1	44.059 N	145.751 E
	9	Lagunnoye (Nikishoro) Sea Cave2	44.056 N	145.749 E
	10	Forest road to the 13 km village (Yaitaikotan)	44.028 N	145.716 E
Iturup Is.	11	Branch of Kuybyshevka (Rubetsu) River	45.138 N	147.796 E
	12	Reydovo (Bettobi) Hot spring	45.242 N	148.012 E
	13	Forest road to Mt.Baranskogo (Sashiusuyama)	45.206 N	147.907 E
	14	Mouse of Rybaki (Arimoi) River	45.205 N	147.844 E
	15	Forest road to the Kuril'sky (Shana) observatory	45.234 N	147.882 E
	16	Kuril'sky (Shana) Salmon Hatchery	45.218 N	147.895 E
	17	Branch of the Kuril'sky (Shana) River	45.132 N	147.970 E
	18	Dammed Lake on Branch of Mineral'naya (Onsen) River	45.247 N	148.014 E
	19	Forest road to Mt.Baranskogo (Sashiusuyama)	45.193 N	147.925 E
	20	Osennaya (Roumon) River Salmon Hatchery	45.013 N	145.538 E
	21	Hillside of Mt.Pereval'naya (Noboriyama)	45.126 N	147.759 E
	22	Blagodatnoye (Toshimoi) Bridge	45.010 N	147.707 E

Honshu and Shikoku. It has been reported from Shikotan Island, Kunashir Island and Iturup Island (Tiunov 1997).

We recorded one male at site17 in Iturup Island, and two female (juvenile and adult) from Kunashir and Iturup islands. The size of the individuals (Table 3, Table 5, Table 6, and Table 7) are not remarkably different from those of Hokkaido.

4. Ussuri whiskered bat

Myotis gracilis Ognev, 1927

This species has been recorded in Japan, limited to northern and eastern Hokkaido (Kawai 2009a). It has been also reported from Shikotan, Kunashir and Iturup Islands (Tiunov 1997).

The systematic treatment of this species had been confusing. Several researchers had treated as a subspecies of *M. brandtii*, or as a species *M. mystacinus*. However, recent genetic studies of individuals from Hokkaido suggested that *M. gracilis* should be considered a valid species (Kawai et al. 2003; Kawai 2009a).

We captured a total of 12 individuals (6 males and 6 females) at 5 sites in Kunashir Island, and a total of 16 individuals (8 males and 8 females) at 7 sites in Iturup Island. The capture sites of this species are related to water bodies but half the number of captures happened in the forest. Kostenko et al. (2004) pointed out that the number individuals of this species in Iturup island is smaller than that of Kunashir island. However, in our survey a larger number of individuals were captured in Iturup, where it seems to be common.

5. Ikonnikov's Myotis

Myotis ikonnikovi Ognev, 1912

This species has been recorded throughout Hokkaido. In Honshu, it has been found at relatively high altitudes, with the exception of Aomori prefecture (Kawai 2009b). This species has

been reported from Kunashir Island (Tiunov 1997).

We captured a total of 7 individuals at 3 sites in Kunashir island. Capture sites are in the forest or along rivers. We did not record it from Iturup Island.

6. Japanese Large-footed bat

Myotis macrodactylus (Temminck, 1840)

This species has been recorded throughout the Japanese archipelago (Sano 2009a), and from Kunashir Island (Tiunov 1997).

We captured a total of 564 individuals at 6 sites in Kunashir Island (Table 2, Fig 1). We could not capture any individuals in Iturup Island. This species is understood to forage above the water surface. In our surveys, most of the bats were captured near or over streams when active at night (Kawai et al. 2011). This is the most abundant bat species in Kunashir Island.

The species was found to roost at several sea caves (1st and 2nd Nikishoro sea cave; site 8 and site 9, Table1, Fig 1) (Kondo 2013). A total of 546 individuals (292 male and 254 female; Table 2) were captured at these caves by hand-net. Of these, a total number of 524 adults of it were banded from 2011 to 2013 (Table 4).

The measurements' range of the species (Table 4) from Kunashir Island is not distinguishable from that of individuals in Hokkaido (Fukui et al. 2009; Sano 2009a). Forearm and wingspan in females are larger than in males. A similar trend was observed for body weight.

Two albinos of this species were captured at the site 3 in 2010 and the 8 in 2012, respectively. Both were adult males. Those individuals seem to lack melanin from their hairs and membranes. However, eyeballs are visibly black or dark red. The measurements of the albinos are not remarkably different from normal individuals

Table 2. The number of bats captured in Kunashir Island and the middle part of Iturup Island.

Species	Locality number	Date	Number of bats ¹	
			Male	Female
<i>Eptesicus nilssonii</i>	1	20100911	A1	
	14	20120829	A1	
<i>Barbastella leucomelas</i>	6	20100915	A1	
<i>Plecotus sacrimontis</i>	4	20100914		J1
	13	20120828		A1
	15	20120830	A2	
	21	20120905		J1
	10	20120804		A1
<i>Myotis gracilis</i>	1	20100911	A1 U1	A2U3
	2	20100912	A1	
	3	20100913	A1	
	4	20100914		J1
	6	20100915	A2	
	11	20120826		A2J1
	14	20120829		A2
	15	20120830	A4	
	12	20120901	A2	
	18	20120901	A2	A1
	20	20120904		A1
	21	20120905		A1
<i>My. ikonnikovi</i>	5	20100915	A1	
	6	20100915	J1	
	6	20100916	A1	A1
	7	20100918	A2	A1
<i>My. macrodactylus</i>	2	20100912	A3	
	3	20100913	A7	A1
	5	20100915	A4J1	
	7	20100918	A1	A1
	8	20110730		A1
	9	20110730	A60J8	A12J1
	9	20110731	A73J8	A54J5
	8	20120804		A51
	9	20120804	A54	A30
	8	20130804	19	71
<i>My. nattereri</i>	9	20130804	70	29
	1	20100911		A1J1
	6	20100915	A1	A1
<i>My. petax</i>	6	20100916	J1	
	2	20100912	A2J3	A2
	3	20100913	A2	A1
	5	20100915	A2J1	J2
	6	20100916		A1
	7	20100918	A3	
	11	20120826	A2J1	
	14	20120829	A2J4	A8J2
	15	20120830	A1	
	16	20120831	A2	J1
	17	20120831	A2	A2
	12	20120901	A1	A1
	18	20120901	A4J3	A7J3
	20	20120904	A2	A3J2
	22	20120907	A2	
<i>Murina ussuriensis</i>	1	20100911	A1	
	4	20100914	A1	J1

¹A: adult, J: juvenile

of the species (Kondo et al. 2011, 2013).

7. Natterer's bat

Myotis nattereri (Kuhl, 1817)

This species has been recorded in Japan limited to the eastern part of Hokkaido, and several limited areas in Honshu. It had been not reported in the Kurils, including Shikotan, Kunashir, and Iturup

Island (Tiunov 1997).

The systematic treatment of this species had been confusing. Japanese researchers have treated it as a subspecies, “*M. nattereri bombinus*” (Sano 2009b). However, researchers from other countries, including Russia, have usually treated it as a different valid species, *M. bombinus* (Tiunov 2011). This is because several researchers have pointed out that the genetic distance between “*M. nattereri bombinus*” and *M. nattereri* is large, suggesting the existence of two valid species (e.g. Kawai et al. 2003, Kruskop et al. 2012).

We captured a total of 5 individuals including 2 juveniles at two sites in Kunashir Island. It means that this species reproduce in the Island. It was the first report of the species in Kunashir Island.

8. Eastern water bat

Myotis petax Hollister, 1912

This species has been recorded in Japan limited to central and eastern Hokkaido (Kawai 2009c). It has been also recorded from Kunashir and Iturup islands (Tiunov 1997).

This species has been formerly included as a subspecies of *M. daubentonii*. However, according to morphological and molecular data, two distinct groups have been identified, the “Western” and “Eastern” (Kawai et al. 2003, Kruskop 2004, Mateev et al. 2005). Based on these results, *M. petax* has been proposed as the valid name for the “Eastern” group (Kruskop 2004, Mateev et al. 2005).

This species is known to forage above the surface of water bodies. In our surveys, most of the bats were captured near or over streams when active at night in Kunashir and Iturup islands. We captured a total 74 individuals from both islands.

This species is the most abundant bat in Iturup Island.

9. Hilgendorf's tube-nosed bat

Murina hilgendorfi (Peters, 1880)

This species has been recorded throughout the Japanese archipelago (Kawai 2009d), and from Kunashir Island (Tiunov 1997). However, we could not capture any individuals at Kunashir and Iturup islands.

Previously, this species was considered as a subspecies of *Murina leucogaster* (Kawai 2009d).

10. Ussurian tube-nosed bat

Murina ussuriensis Ognev, 1913

This species has been recorded throughout Japanese archipelago (Kawai 2009e), and from Kunashir Island (Tiunov 1997).

We captured a total of 3 individuals in Kunashir Island, including one juvenile.

This species has a very unique behavior. Individuals have been found in various structural objects, in tree cavities, under tree bark, in foliage, on the ground, under the leaf litter, in houses, inside a fallen tree, etc. Several individuals have been also found during the day, on the snow in late spring in Hokkaido and Honsyu (Kawai 2009e).

The systematics of the lesser tube-nosed bat in Far East Russia, Sakhalin, East Asia including Japan, has been disputed.

Table 3. Measurements of forearm, body weight, and wing span of the bats in Kunashir Island.

Species	Sex ¹	Age ²	Total number of measured individuals	Forearm (mm)	Body weight (g)	Wing span (mm)	Note
				mean (mini.-max)	mean (mini.-max)	mean (mini.-max)	
<i>Myotis macrodactylus</i> ³	F	A	43	38.24 (32.74-40.30)	9.1 (8.1-10.1)	260.0 (260-260)	BW N=9, FA N=43, WIN N=2 BW N=52, FA N=66, WIN N=17
	M	A	66	37.44 (35.88-39.22)	8.2 (6.7-9.4)	253.8 (243-267)	
<i>Myotis petax</i>	F	A	4	37.04 (35.58-37.97)	7.95 (7.1-9.1)	255.3 (242-263)	BW N=3
		J	2	37.51 (36.38-38.64)	9.60 (9.3-9.9)	257.0 (252-262)	
	M	A	8	36.62 (35.36-38.04)	8.44 (7.6-9.7)	250.6 (245-256)	
		J	4	36.17 (34.24-37.34)	6.37 (5.0-7.7)	249.3 (229-264)	
<i>Myotis ikonnikovi</i>	F	A	2	33.53 (32.84-34.21)	5.75 (5.3-6.2)	225.0 (222-228)	
		J	0				
	M	A	3	33.75 (32.71-34.33)	6.17 (6.0-6.2)	226.3 (221-226)	
		J	2	34.23 (34.12-34.33)	5.35 (4.7-6.0)	230.0 (228-232)	
<i>Myotis gracilis</i>	F	A	2	34.84 (34.82-34.85)	7.50 (7.5-7.5)	236.0 (234-238)	
		J	4	34.71 (33.74-36.25)	6.18 (5.0-8.0)	230.0 (226-233)	
	M	A	4	33.43 (31.9-34.18)	6.28 (5.1-8.2)	223.8 (216-229)	
		J	1	34.40	5.50	227.0	
<i>Myotis nattereri</i>	F	A	1	40.30	6.8	264.0	
		J	0				
	M	A	1	39.13	6.7	254.0	
		J	1	38.55	5.90	255.0	
<i>Eptesicus nilssonii</i>	F	A	0				
		J	0				
	M	A	1	38.89	15.80	265.0	
		J	0				
<i>Plecotus sacrimontis</i>	F	A	0				
		J	1	43.51	9.1		
	M	A	0				
		J	0				
<i>Barbastella leucomelas</i>	F	A	0				
		J	0				
	M	A	1				
		J	0	40.39	10.4	289.0	
<i>Murina ussuriensis</i>	F	A	1	30.85	6.1	235.0	
		J	0				
	M	A	2	28.71 (28.03-29.38)	5.45 (5.3-5.6)	216.5 (215-218)	
		J	0				

¹ F: female, M: male ² A: adult, J: juvenile³ The individuals of *M. macrodactylus* were measured without distinguishing between adults and juveniles.

Conclusion

In Kunashir Island, 8 bat species had been previously recorded. In our survey, 7 of these 8 species were recorded, and two further species (*Myotis nattereri* and *Eptesicus nilssonii*) are new additions to the bat fauna of Kunashir Island. From the middle part of Iturup Island, 4 bat species had been previously recorded. However, no further species was found during our surveys. In

these islands, we captured three types of bats; (1) species that are widely distributed in Hokkaido, (2) species rare in south-western Hokkaido, and common in northern and eastern Hokkaido, (3) and species restricted to northern and eastern Hokkaido. Given that 15 species are known from eastern Hokkaido (Sano et al. 2009, Kondo 2013), and the possibility of a stepping-stone bat dispersal mode between Hokkaido, Kunashir and Iturup islands, differences in species richness suggest that distributional patterns are affected by several factors. To further elucidate these differences, additional bat surveys and the assessment of potential factors limiting the distributions of each species are required.

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Table 4. Number of *Myotis macrodactylus* banded at Nikishoro sea cave.

Year	Date	Locality	Male (recapture)	Female (recapture)
2011	30 Jun.	Nikishoro 1st sea cave	0	1
		Nikishoro 2nd sea cave	60	12
	31 Jun.	Nikishoro 2nd sea cave	73	54
2012	4 Aug.	Nikishoro 1st sea cave	0	51(4)
		Nikishoro 2nd sea cave	54(3)	30(1)
2013	4 Aug.	Nikishoro 1st sea cave	19(1)	71(8)
		Nikishoro 2nd sea cave	70(1)	29(1)
Total			276(5)	248(14)

Table 5. Measurements of cranial and external characters of the bats captured in Kunashir Island.

Species	Locality number	Date	Specimen number	Sex	BW	FA	Wing span	TL	HBL	Tail	Tibia	Ear	Tragus	HFL1	HFL2	GL	CBL
<i>Myotis macrodactylus</i>	3	20100913	2R00495	M	8.1	38.74	267	87.0	46.8	40.2	17.4	16.2	6.2	12.2	13.2		
<i>Myotis macrodactylus</i>	3	20100913	2R00501	M	8.0	38.00	257	90.0	44.8	45.2	17.3	14.2	6.2	12.0	13.0		
<i>Myotis petax</i>	3	20100913	2R00504	F	7.4	36.85	254	90.0	46.8	43.2	17.4	16.2	5.2	12.2	13.2	14.27	13.35
<i>Myotis ikonnikovi</i>	5	20100915	H2063	M	6.0	34.33	232	84.0	47.8	36.2	16.9	11.2	5.2	6.0	7.0	13.12	12.82
<i>Myotis gracilis</i>	2	20100912	H2058	M	6.0	33.67	224									13.75	13.38
<i>Myotis nattereri</i>	1	20100911	2R00484	F	8.5	40.47	279									15.10	14.69
<i>Eptesicus nilssonii</i>	1	20100911	2R00483	M	15.8	38.89	265									15.49	14.97
<i>Plecotus sacrimontis</i>	1	20100914	2R00506	F	9.1	43.51		107.0	56.0	51.0	21.4	38.2	18.2	10.0	11.0	17.20	16.00
<i>Barbastella leucomelas</i>	4	20100915	2R00517	M	10.4	40.39	289	120.0	65.3	54.7	16.9	17.2	10.2	7.0	8.0	15.09	14.10
<i>Murina ussuriensis</i>	4	20100914	H2062	M	5.3	29.38	215	80.0		30.2	14.6	14.2	3.6	7.2	7.2	15.16	14.13

Species	Locality number	Date	Specimen number	Sex	IM3	CM3	M3M3	MRW	ZW	BCW	BCWM	BCH	IOW	RL	BL	mCM3	LMD
<i>Myotis macrodactylus</i>	3	20100913	2R00495	M													
<i>Myotis macrodactylus</i>	3	20100913	2R00501	M													
<i>Myotis petax</i>	3	20100913	2R00504	F	6.02	5.08	5.70	5.58	9.06	7.47	7.52	6.57	3.64	6.16	8.11	5.27	9.92
<i>Myotis ikonnikovi</i>	5	20100915	H2063	M	6.35	5.15	5.48	4.96	8.02	6.71	7.17	5.85	3.69	6.25	6.87	6.74	9.70
<i>Myotis gracilis</i>	2	20100912	H2058	M	6.19	5.16	5.67	4.77	8.18	7.04	7.03	5.71	3.72	6.47	7.28	5.43	10.00
<i>Myotis nattereri</i>	1	20100911	2R00484	F	7.16	5.85	6.29	5.63	-	7.55	7.69	6.70	3.73	6.78	8.32	6.39	11.10
<i>Eptesicus nilssonii</i>	1	20100911	2R00483	M	6.78	5.57	6.24	6.22	9.83	7.67	8.39	6.98	4.15	6.78	8.71	5.87	10.95
<i>Plecotus sacrimontis</i>	1	20100914	2R00506	F	7.08	5.81	-	5.91	8.91	8.40	9.51	7.67	3.57	6.88	10.32	6.64	11.26
<i>Barbastella leucomelas</i>	4	20100915	2R00517	M	5.65	4.78	5.65	5.71	7.74	7.54	8.52	6.70	3.58	5.41	9.68	5.28	9.18
<i>Murina ussuriensis</i>	4	20100914	H2062	M	5.95	5.09	4.91	4.54	-	7.12	7.14	5.48	4.13	7.58	7.58	5.36	10.10

BW (body weight), FA (length of forearm), TL (total length), HBL (head and body length), Tail (length of tail), Tibia (length of tibia), Ear (length of ear), Tragus (length of tragus), HFL1 (length of hind foot with nail), HFL2 (hind foot length without nail), GL (greatest length of skull), CBL (condylobasal length), IM3 (length of upper tooth row from incisor to molar M3), CM3 (length of upper tooth row from canine to molar M3), M3M3 (width between outer margins of molar M3), MRW (maximum rostral width), ZW (zygomatic width), BCW (width of brain case), BCWM (width of brain case at level of mastoid), BCH (height of braincase with auditory bullae), IOW (width of interorbital constriction), RL (length of rostral), BL (length of braincase = GL-RL), mCM3 (length of maxillary tooth row from canine to molar), LMD (lower jaw length from alveole of anterior incisor to articulated process).

Table 6. Measurements of forearm, body weight, and wing span for bats captured in the middle part of Iturup Island.

Species	Sex1	Age2	Number of measured individuals	Forearm (mm)		Body weight (g)		Wing span (mm)	
				mean	(mini.-max)	mean	(mini.-max)	mean	(mini.-max)
<i>Myotis gracilis</i>	F	A	6	34.55	(33.58-35.27)	6.2	(5.4-7.2)	234.8	1
		J	1	35.10		5.4		240.0	
	M	A	6	34.89	(32.75-35.77)	5.6	(5.0-5.8)	235.2	(221-241)
		J							
<i>Myotis petax</i>	F	A	14	36.81	(35.29-37.9)	7.8	(6.4-9.8)	253.6	(247-263)
		J	5	36.75		6.6		245.2	(238-250)
	M	A	14	36.97	(36.18-37.66)	8.0	(6.2-10.4)	252.0	(242-256)
		J	4	36.92	(35.54-38.69)	6.5	(5.6-7.2)	251.0	(249-254)
<i>Plecotus sacrimontis</i>	F	A	1	40.58		10.0		278.0	
		J	1	42.14		11.0		280.0	
	M	A	2	40.99	(39.88-42.09)	8.3	(7.4-9.2)	284.5	(278-291)
		J	0						
<i>Eptesicus nilssonii</i>	F	A	0						
		J	0						
	M	A	1	38.67		10.8		271.0	
		J	0						

1 F:female, M: male

2 A: adult, J: juvenile

Table 7. Measurements of cranial and external characters of the bats captured in the middle part of Iturup Island.

Species	Locality number	Date	Specimen number	sex	BW	FA	Wing span	TL	HBL	Tail	Tibia	Ear	Tragus	HFL1	HFL2	GL	CBL
<i>Myotis petax</i>	11	20120826	SR00322	M	7.6	37.0	257	85.0	45.0	40.0	18.4	16.0	6.0	10.0	9.0	14.09	13.27
<i>Myotis petax</i>	11	20120826	SR00324	M	7.0	36.5	250	86.0	49.0	37.0	18.1	14.0	6.5	10.0	8.5		
<i>Myotis gracilis</i>	11	20120826	H2115	F	5.8	33.6	225	84.0	47.0	37.0	15.2	15.0	7.0	8.0	7.0	13.55	12.68
<i>Myotis gracilis</i>	11	20120826	H2114	F	6.6	34.3	240	83.0	42.0	41.0	15.3	15.0	8.0	7.0	6.0		
<i>Plecotus sacrimontis</i>	19	20120828	SR00325	F	10.0	40.6	278	96.5	45.5	51.0	21.0	36.0	15.0	10.0	10.0	16.32	16.04
<i>Plecotus sacrimontis</i>	15	20120830	SR00352	M	7.4	39.9	278	110.0	59.0	51.0	19.1	36.0	17.0	11.0	10.0		
<i>Eptesicus nilssonii</i>	14	20120829	SR00351	M	10.8	38.7	271	100.0	53.0	47.0	17.3	13.0	12.0	10.0	9.0	15.47	15.21

Species	Locality number	Date	Specimen number	sex	IM3	CM3	M3M3	MRW	ZW	BCW	BCWM	BCH	IOW	RL	BL	mCM3	LMD
<i>Myotis petax</i>	11	20120826	SR00322	M	6.15	5.18	5.80	5.22	9.03	7.45	7.53	6.43	3.64	6.22	7.05	5.45	10.29
<i>Myotis petax</i>	11	20120826	SR00324	M													
<i>Myotis gracilis</i>	11	20120826	H2115	F	6.00	4.86	5.21	4.87	-	6.89	7.03	5.89	3.73	6.01	6.67	4.96	9.70
<i>Myotis gracilis</i>	11	20120826	H2114	F													
<i>Plecotus sacrimontis</i>	19	20120828	SR00325	F	6.73	5.94	6.89	6.07	9.17	8.20	9.31	5.84	3.62	6.89	9.15	6.62	11.18
<i>Plecotus sacrimontis</i>	15	20120830	SR00352	M													
<i>Eptesicus nilssonii</i>	14	20120829	SR00351	M	6.67	5.55	7.15	6.51	10.23	8.26	8.62	7.05	4.48	6.55	8.66	6.05	11.32

BW (body weight), FA (length of forearm), TL (total length), HBL (head and body length), Tail (length of tail), Tibia (length of tibia), Ear (length of ear), Tragus (length of tragus), HFL1 (length of hind foot with nail), HFL2 (hind foot length without nail), GL (greatest length of skull), CBL (condylobasal length), IM3 (length of upper tooth row from incisor to molar M3), CM3 (length of upper tooth row from canine to molar M3), M3M3 (width between outer margins of molar M3), MRW (maximum rostral width), ZW (zygomatic width), BCW (width of brain case), BCWM (width of brain case at level of mastoid), BCH (height of braincase with auditory bullae), IOW (width of interorbital constriction), RL (length of rostral), BL (length of braincase = GL-RL), mCM3 (length of maxillary tooth row from canine to molar), LMD (lower jaw length from alveole of anterior incisor to articulated process).

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- 河合久仁子¹・Mikhail P. Tiunov²・近藤憲久³・Maksim A. Antipin⁴, Victor N. Boiko⁴, 大泰司紀之⁵, 出羽 寛⁶: 国後島と択捉島のコウモリ類
- 我々は、2010年から2013年にかけて行われた国後島および択捉と中部におけるコウモリ類調査によって、695個体(4属9種)のコウモリ類を捕獲した。国後島ではこれまで記録されていた8種のうち7種を捕獲し、さらに2種の新記録種を捕獲した。また、択捉島中部では、これまで記録されていた4種全てを捕獲した。これらの記録により、これまで網羅的に調査が行われてこなかった両島のコウモリ相について新しい見解が示され、それぞれの島で生息するコウモリ種数が異なる事が明確となった。
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