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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: Reidovo (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 (Furuamappu). 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.
- Galinsoga 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: Reidovo (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 [Koshika-giku] (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: Pioner (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. lavieatum* 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-genge] (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: Pioner 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 Leys. [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: Osennyaya 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: Dobrynina 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その他に、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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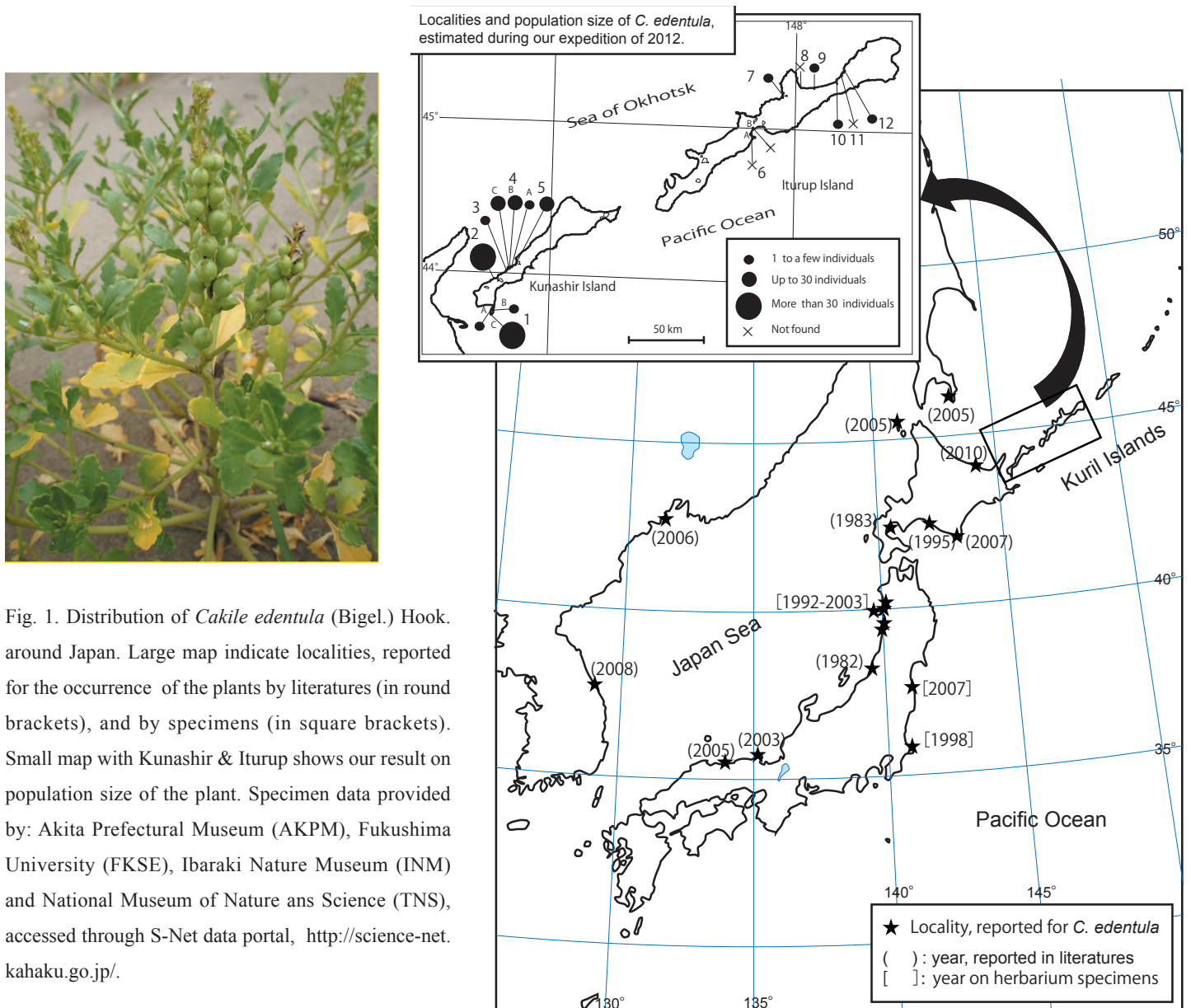


Fig. 1. Distribution of *Cakile edentula* (Bigel.) Hook. around Japan. Large map indicate localities, reported for the occurrence of the plants by literatures (in round brackets), and by specimens (in square brackets). Small map with Kunashir & Iturup shows our result on population size of the plant. 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/>.

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>	Shiobana-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>Datura metel</i>	Chosen-asagao	(+)	A3															
Solanaceae	<i>Datura stramonium var. stramonium</i>	Shiobana Chosen-asagao	(+)	A3															
Solanaceae	<i>Datura 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).

Stae 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.

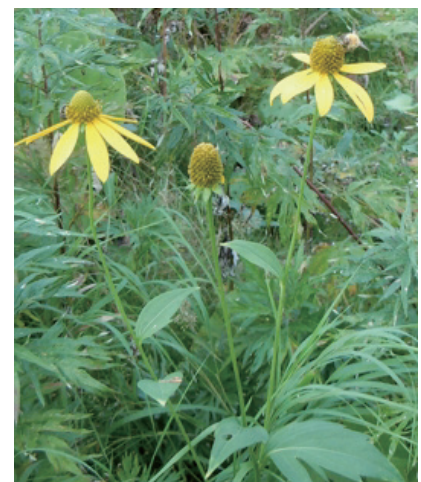
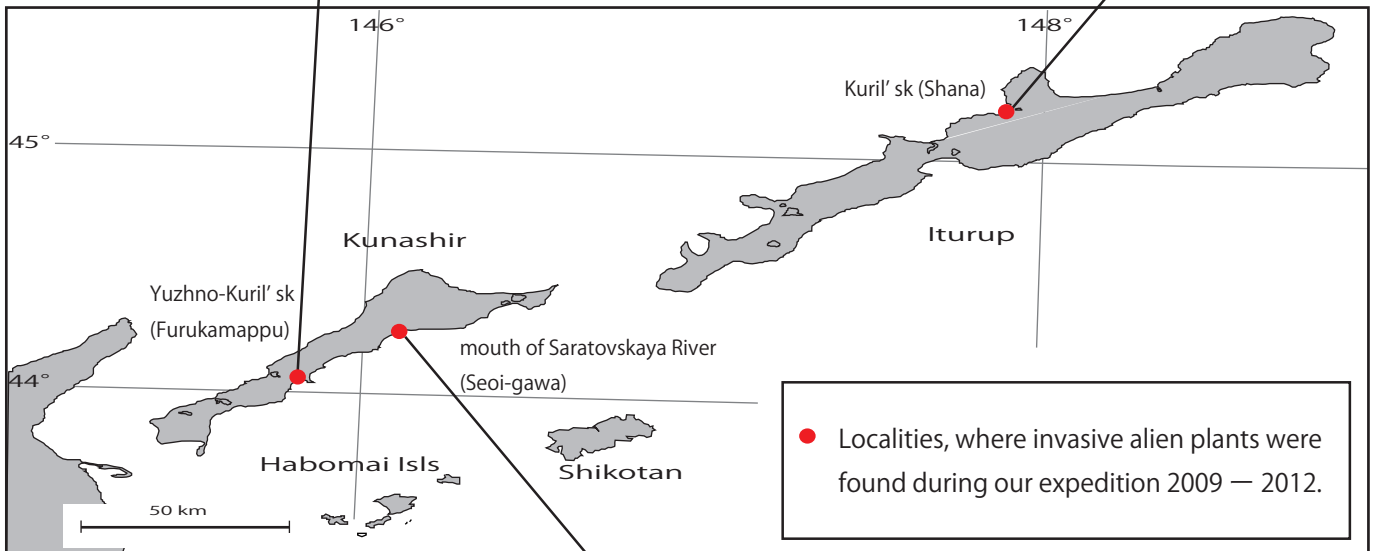
Fig. 2. Invasive alien plants, found during our expedition and their localities.



Aegopodium podagraria



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



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