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

Tomoko Fukuda

Department of Botany, National Museum of Nature and Science, 4-1-1, Amakubo, Tsukuba, Ibaraki 305-0005, JAPAN
E-mail: t-fukuda@kahaku.go.jp

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 tcuck. 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 Kuriî'sk, we visited lakes around Pioner (Kuybyshevskoye, Maloye and other ponds), Reydovo, Kasatka Bay, Lakes Bragodatnoye and Srednye, Osennyaya River, foot of Mt. Baranskogo, and along the road from Kuriî'sk to Pioner. 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.

<table>
<thead>
<tr>
<th>Date</th>
<th>Locality</th>
<th>Attended</th>
<th>Latitude</th>
<th>Longitude</th>
<th>No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aug. 21</td>
<td>Left from Nemuro port.</td>
<td>all</td>
<td>44° 01′ 09″</td>
<td>145° 50′ 35″</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Stayed off the coast of Yuzhno–Kuriî'sk (Furukamappu).</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aug. 22</td>
<td>Arrived at Krabozavodskoye (Anama)</td>
<td>all</td>
<td>43° 49′ 43″</td>
<td>146° 44′ 36″</td>
<td>1–1</td>
</tr>
<tr>
<td></td>
<td>Work at NE part of Krabovaya Bay (Anama-wan)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Work along forest path at SW part of Krabovaya Bay.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Work along seashore at SW part of Krabovaya Bay.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Work at south seashore of Otradnaya Bay.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aug. 23</td>
<td>Work around village Krabozavodskoye.</td>
<td>all</td>
<td>43° 51′ 28″</td>
<td>146° 47′ 52″</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Work at Mt. Shikotan (Shakotan-yama) taking S route.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Work at village Malokuri’skoye (Shakotan-mura).</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aug. 24</td>
<td>Work at Dimitrova Bay (Inemoshiri–wan).</td>
<td>all</td>
<td>43° 49′ 10″</td>
<td>146° 49′ 09″</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Work at a mountain pass from Dimitrova Bay to Malokuri’skoye.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Work at NW part of Mt. Shikotan.</td>
<td>all</td>
<td>43° 52′ 38″</td>
<td>146° 51′ 03″</td>
<td>4–2</td>
</tr>
<tr>
<td></td>
<td>Work around village Krabozavodskoye.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aug. 25</td>
<td>Work at Tserkovnaya Bay (Matsuga-hama).</td>
<td>all</td>
<td>43° 44′ 24″</td>
<td>146° 41′ 23″</td>
<td>7–1</td>
</tr>
<tr>
<td></td>
<td>Work at field station of Tserkovnaya Bay.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Work at Larix forest (Shikotan-matsubara) at W of Tserkovnaya Bay.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Work along the way from Tserkovnaya Bay to Krabozavodskoye.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aug. 26</td>
<td>Work at Mt. Ploskaya (Masuba–yama, or Okkabetsu–yama).</td>
<td>T, S, F</td>
<td>43° 47′ 58″</td>
<td>146° 39′ 28″</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Work at Zvezdnaya Bay (Masuba–wan).</td>
<td>A, N</td>
<td>43° 46′ 17″</td>
<td>146° 36′ 14.5″</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Work around village Krabozavodskoye.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aug. 27</td>
<td>Work at Chiboi (Chiboi–hama).</td>
<td>all</td>
<td>43° 49′ 50.2″</td>
<td>146° 54′ 16.8″</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>Work at S seashore of Krab cape (Kurappu–misaki) .</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Work around light house of Krab cape.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Work at N coast from Krab cape.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Work at Kray Sveta cape (Etannotto–misaki) .</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aug. 28</td>
<td>Work at Mt. Shikotan, taking NW route.</td>
<td>all</td>
<td>43° 52′ 14″</td>
<td>146° 51′ 09″</td>
<td>4–3</td>
</tr>
<tr>
<td></td>
<td>Work around village Krabozavodskoye.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aug. 29</td>
<td>Work at NE part of Mt. Otradnaya (Matakotan–yama).</td>
<td>all</td>
<td>43° 51′ 43″</td>
<td>146° 45′ 47″</td>
<td>14–1</td>
</tr>
<tr>
<td></td>
<td>Work at NE part of Mt. Otradnaya.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Work at NE part of Mt. Otradnaya.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Work around village Krabozavodskoye.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Left from Krabozavodskoye.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aug. 30</td>
<td>Stayed off the coast of Yuzhno–Kuriî'sk.</td>
<td>all</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Returned to Nemuro.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Date</th>
<th>Locality</th>
<th>Attended</th>
<th>Latitude</th>
<th>Longitude</th>
<th>No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>10/20</td>
<td>Left Nemuro port to Kunashiri, arrived off the Yuzhno–Kuriî’sk.</td>
<td>T</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10/21</td>
<td>Landed on Yuzhno–Kuriî’sk (Furukamappu) .</td>
<td>T</td>
<td>44° 2′ 25.2″</td>
<td>145° 51′ 33.9″</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>Meeting at the Nature Reserve Center.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Landed Yuzno–Kuriî’sk.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Remontnyu Cape (Kinakai-zaki)</td>
<td></td>
<td>44° 6′ 38.7″</td>
<td>145° 53′ 57.7″</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td>Arrived at the watchman hut of Saratovskaya River (Seo–gawa)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10/22</td>
<td>Between Saratovskaya River and Tyatina River (Onnebetsu–gawa) .</td>
<td>T</td>
<td>44° 16′ 3.3″</td>
<td>146° 9′ 14.3″</td>
<td>18–1</td>
</tr>
<tr>
<td></td>
<td>Mouth of Tyatina River</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bear Observation site at Tyatina River</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Toisusu trees site.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10/23</td>
<td>Around Saratovskaya River.</td>
<td>T</td>
<td>44° 16′ 13.0″</td>
<td>146° 9′ 29.6″</td>
<td>18–2</td>
</tr>
<tr>
<td>10/24</td>
<td>Between Saratovskaya River and Tyatina River.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Around Saratovskaya River.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Date</td>
<td>Locality</td>
<td>Attended</td>
<td>Latitude</td>
<td>Longitude</td>
<td>No.</td>
</tr>
<tr>
<td>------------</td>
<td>---------------------------------------------------------------------------</td>
<td>----------</td>
<td>----------</td>
<td>-----------</td>
<td>------</td>
</tr>
<tr>
<td>8/17</td>
<td>Left Nemuro port to Kunashir, arrived at Yuzhno-Kuril’sk (Furukamappu)</td>
<td>all</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8/18</td>
<td>Start from Yuzhno-Kuril’sk to the mouth of River Andreyevka.</td>
<td>all</td>
<td>43° 53' 16.1&quot;</td>
<td>145° 37' 28.1&quot;</td>
<td>20-1</td>
</tr>
<tr>
<td></td>
<td>Collection between Cape Chetverikova and a watchhouse at the mouth of River Andreyevka.</td>
<td></td>
<td>43° 53' 3.5&quot;</td>
<td>145° 37' 22.5&quot;</td>
<td>20-2</td>
</tr>
<tr>
<td></td>
<td>Collection between a watchhouse at the mouth of River Andreyevka.</td>
<td></td>
<td>43° 53' 22.77&quot;</td>
<td>145° 37' 28.10&quot;</td>
<td>20-3</td>
</tr>
<tr>
<td></td>
<td>Collection at coastal meadows around Semovodsk.</td>
<td></td>
<td>43° 54' 28.4&quot;</td>
<td>145° 38' 50.9&quot;</td>
<td>21</td>
</tr>
<tr>
<td></td>
<td>Collection at wet meadows at SE of Lake Peschanoye (Tofutsu-ko).</td>
<td></td>
<td>43° 54' 54.1&quot;</td>
<td>145° 38' 32.8&quot;</td>
<td>22</td>
</tr>
<tr>
<td>8/19</td>
<td>Collection between wet meadows at SE of Lake Peschanoye and a coastal meadows at NW of Lake Peschanoye.</td>
<td>all</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Collection at coastal meadow, NW of Lake Peschanoye.</td>
<td></td>
<td>43° 56' 59.6&quot;</td>
<td>145° 35' 15.5&quot;</td>
<td>23-1</td>
</tr>
<tr>
<td></td>
<td>Collection along the sea coast between NW of Lake Peschanoye and Cape Znamenka (Nihon-iwa).</td>
<td></td>
<td>43° 56' 35.7&quot;</td>
<td>145° 33' 39.4&quot;</td>
<td>23-2</td>
</tr>
<tr>
<td>8/20</td>
<td>Collection between the entrance of climbing route to Mt. Golovnino (Tomari-yama) and Lake Goryacheye (Ichibishinai-ko).</td>
<td>all</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Collection at S coast of Lake Goryacheye.</td>
<td></td>
<td>43° 51' 48.5&quot;</td>
<td>145° 30' 37.1&quot;</td>
<td>24-1</td>
</tr>
<tr>
<td>8/21</td>
<td>Collection at E of Lake Veslovskoe, meadows and lakeside.</td>
<td>all</td>
<td>43° 43' 10.8&quot;</td>
<td>145° 33' 23.3&quot;</td>
<td>25-1</td>
</tr>
<tr>
<td></td>
<td>Collection between Lake Veslovskoe and Cape Veslo (Keramui-zaki).</td>
<td></td>
<td>43° 42' 31.8&quot;</td>
<td>145° 33' 34.5&quot;</td>
<td>25-2</td>
</tr>
<tr>
<td></td>
<td>Collection at Cape Veslo.</td>
<td></td>
<td>43° 39' 10.7&quot;</td>
<td>145° 32' 41.4&quot;</td>
<td>25-3</td>
</tr>
<tr>
<td></td>
<td>Collection at N of Lake Veslovskoe.</td>
<td></td>
<td>43° 43' 48.8&quot;</td>
<td>145° 33' 32.6&quot;</td>
<td>25-4</td>
</tr>
<tr>
<td>8/22</td>
<td>Collection around a watchhouse at the mouth of River Andreyevka.</td>
<td>all</td>
<td>43° 52' 46.26&quot;</td>
<td>145° 36' 27.03&quot;</td>
<td>20-1</td>
</tr>
<tr>
<td></td>
<td>Collection at coniferous-broadleaved forests, W of a watchhouse.</td>
<td></td>
<td>43° 52' 46.26&quot;</td>
<td>145° 36' 27.03&quot;</td>
<td>20-4</td>
</tr>
<tr>
<td></td>
<td>Collection between 13km village (Yaitai-kotan) and Cape Stolbchatyy (Zaimoku-iwa).</td>
<td></td>
<td></td>
<td></td>
<td>19</td>
</tr>
<tr>
<td></td>
<td>Collection at Cape Stolbchatyy.</td>
<td></td>
<td>44° 01' 32.1&quot;</td>
<td>145° 40' 35.8&quot;</td>
<td>26</td>
</tr>
<tr>
<td></td>
<td>Collection at NW side of Lake Aliger (Arigeru-ko).</td>
<td></td>
<td>44° 02' 49.6&quot;</td>
<td>145° 44' 25.3&quot;</td>
<td>27-1</td>
</tr>
<tr>
<td></td>
<td>Collection at sea coast, W of Lake Aliger.</td>
<td></td>
<td>44° 02' 55.8&quot;</td>
<td>145° 44' 20.4&quot;</td>
<td>27-2</td>
</tr>
<tr>
<td></td>
<td>Seacoast at W of Lake Legunnoye (Nikishoro-ko).</td>
<td></td>
<td>44° 03' 33.3&quot;</td>
<td>145° 44' 47.8&quot;</td>
<td>28</td>
</tr>
<tr>
<td>8/23</td>
<td>Collection at Yuzhno-Kuril’sk, Lake Serebryanoye (Furukamappu-numa).</td>
<td>KY, S, KT</td>
<td>44° 03' 05.69&quot;</td>
<td>145° 49' 18.51&quot;</td>
<td>29-1</td>
</tr>
<tr>
<td></td>
<td>Collection at Cape Sukacheva (Chikappunai).</td>
<td>A, N</td>
<td>44° 04' 41.66&quot;</td>
<td>145° 52' 48.07&quot;</td>
<td>30</td>
</tr>
<tr>
<td>8/24</td>
<td>Move to Iturup by ship “Etopirika”.</td>
<td>T, A, N, KT, F</td>
<td>43° 59' 57.60&quot;</td>
<td>145° 46' 04.94&quot;</td>
<td>31</td>
</tr>
<tr>
<td>8/25</td>
<td>Collection at Stolbovskyy Ecological Road, W of village Goryachiy Pryazh (Seseki), along branch of Lesnaya River (Shojin-gawa).</td>
<td>KY, S</td>
<td>44° 00' 25.91&quot;</td>
<td>145° 40' 59.94&quot;</td>
<td>31-1</td>
</tr>
<tr>
<td></td>
<td>Collection at S coast of Cape Stolbchatyy (Shimanobori-kaigan).</td>
<td></td>
<td>44° 00' 42.0&quot;</td>
<td>145° 40' 37.8&quot;</td>
<td>31-2</td>
</tr>
<tr>
<td></td>
<td>Collection along coastal line from S coast of Cape Stolbchatyy to Tret’yakovo (Chibukariibetsu).</td>
<td></td>
<td>43° 59' 22.36&quot;</td>
<td>145° 38' 59.15&quot;</td>
<td>31-3</td>
</tr>
<tr>
<td>8/26</td>
<td>Collection at Yuzhno-Kuril’sk, Lake Serebryanoye.</td>
<td>KY, S</td>
<td>44° 03' 24.21&quot;</td>
<td>145° 50' 14.88&quot;</td>
<td>29-2</td>
</tr>
<tr>
<td>8/27</td>
<td>Return to Nemuro port.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Date</th>
<th>Locality</th>
<th>Attended</th>
<th>Latitude</th>
<th>Longitude</th>
<th>No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>8/25</td>
<td>Landed on Kitvyy (Nayoka). Move to Kuril’sk (Shana).</td>
<td>T.A.N.K.T.F</td>
<td>45° 13’ 38.8”</td>
<td>147° 52’ 59.6”</td>
<td>32</td>
</tr>
<tr>
<td>8/26</td>
<td>Move from Kuril’sk via Reydovo (Bettobu) to Bay of Tornaya (Toro) by a boat. Landed on Tornaya. Collection at Bay of SoFa (Sokya)</td>
<td>T.A.N.K.T.F</td>
<td>45° 16’ 42.7”</td>
<td>148° 01’ 06.4”</td>
<td>33</td>
</tr>
<tr>
<td>8/27</td>
<td>Collection at Bay of Dobrynina (Otoimaushi).</td>
<td>T.A.N.K.T.F</td>
<td>45° 21’ 38.6”</td>
<td>148° 27’ 20.3”</td>
<td>34-1</td>
</tr>
<tr>
<td>8/28</td>
<td>Collection at Bay of Sof’a (Sokiya).</td>
<td>T.A.N.K.T.F</td>
<td>45° 23’ 17.8”</td>
<td>148° 25’ 50.0”</td>
<td>35</td>
</tr>
<tr>
<td>8/29</td>
<td>Move from Bay or Tornaya via Bay of Parusnaya (Porosu) through Vetrovoy Persheyek (Rucharu-baro) to the Pacific side (Higashi-rucharu). Collection at Pacific side of Vetrovoy Persheyek. Work at Balyye skaly (Bira-gyojo). Work at Chernyye skaly (Biyonotsu-gyojo). Work at 9km lot (Tokochiya-gyojo).</td>
<td>T.A.N.K.T.F</td>
<td>45° 05’ 22.2”</td>
<td>147° 39’ 44.1”</td>
<td>40-4</td>
</tr>
<tr>
<td>9/1</td>
<td>Collection within the city of Kuril’sk. Collection at Bay of Olya (Ohyo), N of Reydovo (Bettobu). Collection at several places around Reydovo.</td>
<td>T.A.N.K.T.F</td>
<td>45° 00’ 14.7”</td>
<td>147° 43’ 39.6”</td>
<td>42-4</td>
</tr>
<tr>
<td>9/2</td>
<td>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 Srednaye (Rebun–numa) and N lake (Yanke–numa). N coast of Lake Srednaye. Collection at Lake Bragodatnye (Toshimoi-ko). Collection at Wetland with Larix, N of Lake Srednaye. Collection at riverside within Kuril’sk.</td>
<td>T.A.N.K.T.F</td>
<td>45° 10’ 02.6”</td>
<td>147° 57’ 12.9”</td>
<td>45-4</td>
</tr>
<tr>
<td>9/3</td>
<td>Specimen work at Kuril’sk.</td>
<td>T.A.N.K.T.F</td>
<td>45° 12’ 24.2”</td>
<td>147° 54’ 33.1”</td>
<td>45-5</td>
</tr>
<tr>
<td>9/4</td>
<td>Collection at the mouth of River Osnnaya (Oito). Collection at three sites between River Osennaya and Pioneer (Rubetsu).</td>
<td>T.A.N.K.T.F</td>
<td>45° 13’ 28.9”</td>
<td>147° 53’ 52.2”</td>
<td>45-7</td>
</tr>
<tr>
<td>9/5</td>
<td>Move to Mt. Baranskogo (Sashiusu-yama), sulphur volcanic site. Collection at river hot spring. Collection at Betula ermanii forests on the pass. Collection at Quercus crispula forests at lower altitude.</td>
<td>T.A.N.K.T.F</td>
<td>45° 13’ 28.9”</td>
<td>147° 53’ 52.2”</td>
<td>45-7</td>
</tr>
<tr>
<td>9/6</td>
<td>Collection at several sites between Rybaki (Arimoi) and Pioneer. Collection at Quercus crispula forest, S of Kuril’sk. Collection at the side of Lake Lebednoye (Shana–numa). Collection at the suburbs of city of Kuril’sk.</td>
<td>T.A.N.K.T.F</td>
<td>45° 13’ 28.9”</td>
<td>147° 53’ 52.2”</td>
<td>45-7</td>
</tr>
</tbody>
</table>

---

Table 4: Locality columns are filled out with the actual locations and dates of the expedition, including specific names and coordinates.

---

Table 4: The table shows a detailed itinerary of the expedition, listing the places visited, the activities carried out, and the dates of visit, along with the corresponding latitude and longitude coordinates.
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

References


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

Tomoko Fukuda¹, Aleksandr A. Taran², Hiroyuki Sato³, Yukie Kato⁴ and Hideki Takahashi⁵

¹Department of Botany, National Museum of Nature and Science, 4-1-1, Amakubo, Tsukuba, 305-0003 JAPAN. ²Sakhalin Branch of Botanical Garden-Institute, Far East Branch, Russian Academy of Sciences, 25, ul. Gorkogo, Yuzhno-Sakhalinsk, Box 34, 693023 RUSSIA; ³Graduate School of Agriculture, Hokkaido University, N9 W9, Kita-ku, Sapporo, 060-8589 JAPAN; ⁴Kushiro City Museum, 1-7, Shunkodai, Kushiro, 085-0822 JAPAN; ⁵The Hokkaido University Museum, N10 W8, Kita-ku, Sapporo, 060-0810 JAPAN

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 (Lede:) 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 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 SAPS (Herbarium, the Hokkaido University Museum, Sapporo).

The naturalized age 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. serumina (Kuntze) McNeill, Tanacetum vulgare L. var. vulgare, Echium vulgare L., Symphytum × uplandicum Nomin, Brassica napus L., Cakile edentula (Bigelow) Hook., Saponaria officinalis L., Chenopodium ficifolium Sm., Lupinus polyphyllus Lindl., Mellilotus officinalis (L.) Pall. subsp. suauleons (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!


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!


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.


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


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 tomentosum Mill. [Watage-gobō] (Hokkaido: A3) Russian period.


**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.


*Centaurea jacea* L. [Yaguruma-azami] (Hokkaido: B) Russian period.


**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.


*Erigeron annuus* (L.) Pers. [Himejoon] (Hokkaido: A3) Russian period.


**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.

*Galinsoga parviflora* Cav. [Kogome-giku] (Hokkaido: B) Russian period.


**Leontodon autumnalis** L. [Akino-tanpopo-modoki] (Hokkaido: −) Russian period.


**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.


**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.


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.


Note: In Sakhalin, this species commonly invades mountain meadows.

Rudbeckia hirta [Arage-hangon-sō] (Hokkaido: B) Russian period.

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).


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!

Note: Igarashi (2001) listed this variety as a naturalized plant on Hokkaido. This variety is planted in gardens, and has escaped often on Hokkaido.

SHIKOTAN: Aug. 6, 2010. A. Taran s.n.


Solidago gigantea Aiton subsp. serotina (Kuntze) McNeill [Ō-awadachi-sō] (Hokkaido: A2) Newest period!

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!

Note: This variety was growing in a wasteland within the village of Reydovo.

Taraxacum officinale [Seiyō-tanpopo] (Hokkaido: A2) Japanese period?

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.

BORAGINACEAE

Ecium vulgare L. [Shibenaga-murasaki] (Hokkaido: B) Newest period!

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!

**BRASSICACEAE**

*Brassica napus* L. [Seiyō-aburana] (Hokkaido: B) Newest period!

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

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

*Caryophyllaceae*

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

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

*Saponaria officinalis* L. [Sabon-sō] (Hokkaido: B) Newest period!


It is regarded as a prehistorically introduced plant in Japan (as *C. holosteoides* var. *hallaisanense* in Shimizu 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.

*Note:* This species is regarded as a prehistorically introduced plant in Japan (as *C. holosteoides* var. *hallaisanense* in Shimizu 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.

*Stellaria media* [Ko-hakobe] (Hokkaido: B) Russian period.

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

**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.


This species was regarded as a prehistorically introduced plant in Japan (as *C. holosteoides* var. *hallaisanense* in Shimizu 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.

*Note:* This species is regarded as a prehistorically introduced plant in Japan (as *C. holosteoides* var. *hallaisanense* in Shimizu 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.

*Stellaria media* [Ko-hakobe] (Hokkaido: B) Russian period.

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

**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.


This species was regarded as a prehistorically introduced plant in Japan (as *C. holosteoides* var. *hallaisanense* in Shimizu 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.

*Note:* This species is regarded as a prehistorically introduced plant in Japan (as *C. holosteoides* var. *hallaisanense* in Shimizu 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.

*Stellaria media* [Ko-hakobe] (Hokkaido: B) Russian period.

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

**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.
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.

**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!

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

FABACEAE

*Lupinus polyphyllus* Lindl. [Shukkon-lupinus] (Hokkaido: A3) Russian period.

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


**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.

GERANIACEAE

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

**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!

**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.

JUNCACEAE

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

**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?


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?


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) Russian period.


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**


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!


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).

**PLANTAGINACEAE**

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


Veronica chamaedrys L. [Karafuto-hiyokusō] (Hokkaido: B) Russian period.


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.


Dactylis glomerata L. (Kamo-gaya) (Hokkaido: A3) Japanese period.


Note: It is regarded as a prehistorically introduced plant in Japan (Shimizu 2003).

Bromus inermis Leyss. [Ko-su zumeno-chahiki] (Hokkaido: A3) Russian period.


Elytrigia repens (L.) Desv. ex B.D.Jackson var. aristata (Doell) Prokud. [Noge-shiba-mugi] (Hokkaido: A3) Newest period!


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 [Shibamugi] (Hokkaido: A3) Russian period.


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.

Festuca pratensis [Hirohano-ushinokegusa] (Hokkaido: A3) Russian period.

KUNASHIR: Cape Chetverikova to mouth of Andreyevka River.


**Note**: Barkalov (2009) recognized it as a native plant of the Kurils. Barkalov (2009) regarded it as the naturalized species of the Kuril Islands, but Miyabe (1860) has already recorded it from the Kurils. Here we regard it as a native plant of the Kurils as in the opinion of Barkalov (2009).

**Note**: It is a very common naturalized plants of the southern Kurils.


**Note**: Barkalov (2009) recognized it as a naturalized plant of the Kurils. Barkalov (2009) regarded it as a naturalized species of the Kuril Islands, but Miyabe (1860) has already recorded it from the Kurils. Here we regard it as a native plant of the Kurils as in the opinion of Barkalov (2009).


**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.

**Holcus lanatus** L. [Hoso-mugi] (Hokkaido: A3) Newest period!


**Note**: Barkalov (2009) reported this species from Paramushir of the northern Kurils, but not from the southern Kurils.
**Poa trivialis** L. [Ō-suzumeno-katabira] (Hokkaido: A3) Russian period.


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


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


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


Note: Plants collected from Dobrynin Bay and from Srednerey, 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.


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.


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.


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


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.
In the Russian period, 154 introduced species were recorded. Of these, 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 introduced species increased was three times higher than in the prehistoric to 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, Agrostis gigantea L., and others. Barkalov (2009) described the naturalized species commonly found on almost all the Kuril Islands: Phleum pratense L., P. 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.

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.

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.

**Rosaceae**


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

**Rubiaceae**

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

**Solanaceae**

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

**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).
In the newest period, species categorized as A2–A3 in the Blue list of Hokkaido (Hokkaido, 2010) included *Aegopodium podagaria* 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 *Odontites* 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. Tyaty. 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 Lebedinoye (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.
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.

Acknowledgements

We thank M. A. Antipin, I. G. Bobyr, A. Budaev, A. E. Loguntssev, and I. A. Nevedomskaya of the State Natural Reserve "Kurilskiy" for their great help in our field expedition. This study was partly supported by Grant-in-Aid No. 21405009 from the Japan Society for the Promotion of Science to H. Takahashi.

References

福田知子, Taran, A. 佐藤広行, 加藤ゆき恵, 高橋英樹: 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への、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。

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 ans Science (TNS), accessed through S-Net data portal, http://science-net.kahaku.go.jp/.
<table>
<thead>
<tr>
<th>Family</th>
<th>Scientific names in Japan 1)</th>
<th>JAPANESE NAME</th>
<th>Distribution by Terrestrial 2)</th>
<th>Our result 3)</th>
<th>Period 4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amaranthaceae</td>
<td>Chenopodium album</td>
<td>Shiroza</td>
<td>+</td>
<td>B</td>
<td>AL</td>
</tr>
<tr>
<td>Asteraeae</td>
<td>Matricaria matricarioides</td>
<td>Koshka-giku</td>
<td>(+)</td>
<td>B</td>
<td>AL</td>
</tr>
<tr>
<td>Brassicaceae</td>
<td>Capsella bursa-pastoris</td>
<td>Nazuna</td>
<td>+</td>
<td>+</td>
<td>AL</td>
</tr>
<tr>
<td>Caryophyllaceae</td>
<td>Silene auriculata</td>
<td>Minatogiku</td>
<td>+</td>
<td>+</td>
<td>AL</td>
</tr>
<tr>
<td>Caryophyllaceae</td>
<td>Stellaria media</td>
<td>Ko-hakobe</td>
<td>+</td>
<td>A</td>
<td>AL</td>
</tr>
<tr>
<td>Plantaginaceae</td>
<td>Plantago major</td>
<td>Seyo-obako</td>
<td>+</td>
<td>B</td>
<td>AL RA</td>
</tr>
<tr>
<td>Poaceae</td>
<td>Poa annua</td>
<td>Suzume-no-tatari</td>
<td>+</td>
<td>+</td>
<td>AL VO</td>
</tr>
<tr>
<td>Poaceae</td>
<td>Poa pratensis</td>
<td>Nagahara-gusa</td>
<td>+</td>
<td>+</td>
<td>AL OF</td>
</tr>
<tr>
<td>Polygonaceae</td>
<td>Polygonum aviculare</td>
<td>Miyahanaagi</td>
<td>+</td>
<td>+</td>
<td>AL RA</td>
</tr>
<tr>
<td>Asteraceae</td>
<td>Coreopsis tinctoria</td>
<td>Hime-mukashi-yomogi</td>
<td>(+)</td>
<td>A</td>
<td>AL OF</td>
</tr>
<tr>
<td>Asteraceae</td>
<td>Senecio vulgaris</td>
<td>Naboro-giku</td>
<td>(+)</td>
<td>A</td>
<td>AL RA</td>
</tr>
<tr>
<td>Asteraceae</td>
<td>Sonchus asper</td>
<td>Otomo-najasetsu</td>
<td>+</td>
<td>B</td>
<td>AL</td>
</tr>
<tr>
<td>Asteraceae</td>
<td>Taraxacum flavescentum</td>
<td>Amami-tanpopo</td>
<td>(+)</td>
<td>A</td>
<td>AL RA</td>
</tr>
<tr>
<td>Asteraceae</td>
<td>Taraxacum officinale</td>
<td>Seyo-tanpopo</td>
<td>(+)</td>
<td>A</td>
<td>AL OF</td>
</tr>
<tr>
<td>Boraginaceae</td>
<td>Cynoglossum aspernum</td>
<td>Oni-ruriko</td>
<td>+</td>
<td>O</td>
<td>AL RA</td>
</tr>
<tr>
<td>Boraginaceae</td>
<td>Arabis hispida</td>
<td>Yama-hatazao</td>
<td>+</td>
<td>+</td>
<td>AL OF</td>
</tr>
<tr>
<td>Brassicaceae</td>
<td>Brassica nigra-sativa</td>
<td>Kikin-garaashi</td>
<td>(+)</td>
<td>B</td>
<td>AL RA</td>
</tr>
<tr>
<td>Brassicaceae</td>
<td>Brassica napus</td>
<td>Hatazao</td>
<td>+</td>
<td>+</td>
<td>AL OF</td>
</tr>
<tr>
<td>Campanulaceae</td>
<td>Campanula latifolia</td>
<td>Giant bell flower</td>
<td>+</td>
<td>O</td>
<td>AL</td>
</tr>
<tr>
<td>Caryophyllaceae</td>
<td>Stenogyne nitidiora</td>
<td>Tsuchi-kito-senno</td>
<td>+</td>
<td>B</td>
<td>AL RA</td>
</tr>
<tr>
<td>Caryophyllaceae</td>
<td>Spergula arvensis</td>
<td>Nohara-tusekusa</td>
<td>(+)</td>
<td>A</td>
<td>AL OF</td>
</tr>
<tr>
<td>Commelinaceae</td>
<td>Commelina communis</td>
<td>Tsuyu-kusa</td>
<td>+</td>
<td>+</td>
<td>AL RA</td>
</tr>
<tr>
<td>Fabaceae</td>
<td>Trifolium pratense</td>
<td>Murasaki-tusekusa</td>
<td>(+)</td>
<td>A</td>
<td>AL OF</td>
</tr>
<tr>
<td>Fabaceae</td>
<td>Trifolium hybridum</td>
<td>Shiro-tusekusa</td>
<td>+</td>
<td>+</td>
<td>AL OF</td>
</tr>
<tr>
<td>Geraniaceae</td>
<td>Geranium sibiricum</td>
<td>Ishio-fuso</td>
<td>+</td>
<td>+</td>
<td>AL OF</td>
</tr>
<tr>
<td>Junaceae</td>
<td>Junco biennis</td>
<td>Hime-Kage-zekisho</td>
<td>+</td>
<td>+</td>
<td>AL OF</td>
</tr>
<tr>
<td>Junaceae</td>
<td>Junco tetanus</td>
<td>Kusa-i</td>
<td>+</td>
<td>+</td>
<td>AL OF</td>
</tr>
<tr>
<td>Lamiales</td>
<td>Rhodiola ciliata</td>
<td>Nagahara -oku</td>
<td>+</td>
<td>-</td>
<td>AL</td>
</tr>
<tr>
<td>Lamiales</td>
<td>Geolipis bifida</td>
<td>Ohizume -odoriko -so</td>
<td>(+)</td>
<td>A</td>
<td>AL CR</td>
</tr>
<tr>
<td>Lamiales</td>
<td>Lamium amplexicae</td>
<td>Hotoke -no -za</td>
<td>+</td>
<td>B</td>
<td>AL RA</td>
</tr>
<tr>
<td>Onagraceae</td>
<td>Oenothera biennis</td>
<td>Me-matsu-yu-gusa</td>
<td>(+)</td>
<td>A</td>
<td>AL OF</td>
</tr>
<tr>
<td>Onagraceae</td>
<td>Oenothera corymbosa</td>
<td>O - matsumoto -gusa</td>
<td>(+)</td>
<td>A</td>
<td>AL OF</td>
</tr>
<tr>
<td>Platanifoliaceae</td>
<td>Platanus acerifolia</td>
<td>Matsumoto -gusa zoku</td>
<td>-</td>
<td>O</td>
<td>AL RA</td>
</tr>
<tr>
<td>Plantaginaceae</td>
<td>Veronica scutellata</td>
<td>Hobo - kawadzisha</td>
<td>-</td>
<td>O</td>
<td>AL RA</td>
</tr>
<tr>
<td>Poaceae</td>
<td>Agrostis stolonifera</td>
<td>Hai - honza -gusa</td>
<td>(+)</td>
<td>B</td>
<td>AL OF</td>
</tr>
<tr>
<td>Poaceae</td>
<td>Avena fatua</td>
<td>Karasu - mugi</td>
<td>(+)</td>
<td>B</td>
<td>AL RA</td>
</tr>
<tr>
<td>Poaceae</td>
<td>Dactylis glomerata</td>
<td>Kano - gya</td>
<td>(+)</td>
<td>A</td>
<td>AL OF</td>
</tr>
<tr>
<td>Poaceae</td>
<td>Phleum pratense</td>
<td>O - awagaei</td>
<td>(+)</td>
<td>A</td>
<td>AL OF</td>
</tr>
<tr>
<td>Polygonaceae</td>
<td>Fallopia convolvulus</td>
<td>Soba - kaurara</td>
<td>+</td>
<td>B</td>
<td>AL OF</td>
</tr>
<tr>
<td>Polygonaceae</td>
<td>Fallopia duchesii</td>
<td>Tsunour - tate</td>
<td>+</td>
<td>MA</td>
<td>AL OF</td>
</tr>
<tr>
<td>Polygonaceae</td>
<td>Persica lapathifolia var. incana</td>
<td>Sanae - tade</td>
<td>+</td>
<td>B</td>
<td>AL RA</td>
</tr>
<tr>
<td>Polygonaceae</td>
<td>Persicaria nepalensis</td>
<td>Tani - soba</td>
<td>+</td>
<td>+</td>
<td>AL OF</td>
</tr>
<tr>
<td>Polygonaceae</td>
<td>Rumex aceto-ella var. pyreneeus</td>
<td>Hime - suba</td>
<td>(+)</td>
<td>A</td>
<td>AL OF</td>
</tr>
<tr>
<td>Polygonaceae</td>
<td>Rumex longifolius</td>
<td>Nodai</td>
<td>+</td>
<td>+</td>
<td>AL OF</td>
</tr>
<tr>
<td>Polygonaceae</td>
<td>Rumex obtusifolius</td>
<td>Ez - no - shishigushi</td>
<td>(+)</td>
<td>A</td>
<td>AL OF</td>
</tr>
<tr>
<td>Solanaceae</td>
<td>Solanum coellum</td>
<td>Shu - hozuki</td>
<td>(+)</td>
<td>A</td>
<td>AL OF</td>
</tr>
<tr>
<td>Alismataceae</td>
<td>Alisma plantago - aquatica var. orientale</td>
<td>Sai - omokka</td>
<td>+</td>
<td>+</td>
<td>AL RA</td>
</tr>
<tr>
<td>Amaranthaceae</td>
<td>Amaranthus biloba</td>
<td>Amerika - biyato</td>
<td>+</td>
<td>A</td>
<td>AL RA</td>
</tr>
<tr>
<td>Amaranthaceae</td>
<td>Chenopodium glaucum</td>
<td>Uraka - orako</td>
<td>(+)</td>
<td>B</td>
<td>AL</td>
</tr>
<tr>
<td>Amaranthaceae</td>
<td>Chenopodium hybridum</td>
<td>Usuba - akaza</td>
<td>(+)</td>
<td>B</td>
<td>AL RA</td>
</tr>
<tr>
<td>Amaranthaceae</td>
<td>Narcissus poeticus</td>
<td>Kushibe - zuisen</td>
<td>(+)</td>
<td>B</td>
<td>CU</td>
</tr>
<tr>
<td>Amaranthaceae</td>
<td>Narcissus pseudonarcissus</td>
<td>Rapan - zuisen</td>
<td>(+)</td>
<td>B</td>
<td>CU RA</td>
</tr>
<tr>
<td>Apiales</td>
<td>Angelica edulis</td>
<td>Ama - yu</td>
<td>+</td>
<td>O</td>
<td>CU RA</td>
</tr>
<tr>
<td>Apiales</td>
<td>Carum carvi</td>
<td>Kyazwe</td>
<td>-</td>
<td>O</td>
<td>AL RA</td>
</tr>
<tr>
<td>Apiales</td>
<td>Comus moschatus</td>
<td>Doku - ninjy</td>
<td>(+)</td>
<td>A</td>
<td>AL RA</td>
</tr>
<tr>
<td>Apiales</td>
<td>Acinos calamus</td>
<td>Shoubu</td>
<td>+</td>
<td>+</td>
<td>AL RA</td>
</tr>
<tr>
<td>Apiales</td>
<td>Achillea alpina sp. alpina</td>
<td>Nokogiri - so</td>
<td>+</td>
<td>+</td>
<td>AL OF</td>
</tr>
<tr>
<td>Apiales</td>
<td>Achillea millefolium</td>
<td>Seyo - Nokopriso</td>
<td>(+)</td>
<td>A</td>
<td>AL CR</td>
</tr>
<tr>
<td>Apiales</td>
<td>Achillea nigrescens</td>
<td>Nokogiri - so zoku</td>
<td>+</td>
<td>O</td>
<td>AL RA</td>
</tr>
<tr>
<td>Apiales</td>
<td>Astragalus lagas</td>
<td>Gakke</td>
<td>(+)</td>
<td>A</td>
<td>AL OF</td>
</tr>
<tr>
<td>Apiales</td>
<td>Astragalus tomentosum</td>
<td>Gobo - zoku</td>
<td>-</td>
<td>O</td>
<td>AL OF</td>
</tr>
<tr>
<td>Apiales</td>
<td>Artemisia feddei</td>
<td>Hime - yomogi</td>
<td>+</td>
<td>A</td>
<td>AL RA</td>
</tr>
<tr>
<td>Apiales</td>
<td>Artemisia vulgaris</td>
<td>Yomogo - zoku</td>
<td>+</td>
<td>A</td>
<td>AL RA</td>
</tr>
<tr>
<td>Apiales</td>
<td>Asarum vernalese</td>
<td>Yusu - giku</td>
<td>(+)</td>
<td>A</td>
<td>CU RA</td>
</tr>
<tr>
<td>Apiales</td>
<td>Bells perennis</td>
<td>Hina - giku</td>
<td>(+)</td>
<td>B</td>
<td>CU OF</td>
</tr>
<tr>
<td>Apiales</td>
<td>Bidens frondosa</td>
<td>Amerika - sendar - gusa</td>
<td>(+)</td>
<td>A</td>
<td>AL RA</td>
</tr>
<tr>
<td>Apiales</td>
<td>Bidens radata</td>
<td>Ezo - no - taokagi</td>
<td>+</td>
<td>A</td>
<td>AL OF</td>
</tr>
<tr>
<td>Apiales</td>
<td>Bidens triquetra</td>
<td>Takoji</td>
<td>+</td>
<td>O</td>
<td>AL RA</td>
</tr>
<tr>
<td>Apiales</td>
<td>Breaea setosa</td>
<td>Ezo - no - kissho - azami</td>
<td>+</td>
<td>+</td>
<td>AL OF</td>
</tr>
<tr>
<td>Apiales</td>
<td>Centaurea jacea</td>
<td>Yaguruma - azami</td>
<td>+</td>
<td>B</td>
<td>AL RA</td>
</tr>
<tr>
<td>Apiales</td>
<td>Centaurea scabiosa</td>
<td>Yaguruma - azami zoku</td>
<td>+</td>
<td>B</td>
<td>AL RA</td>
</tr>
<tr>
<td>Apiales</td>
<td>Citharexum integerrimum</td>
<td>Kiku - niga</td>
<td>(+)</td>
<td>B</td>
<td>AL RA</td>
</tr>
<tr>
<td>Apiales</td>
<td>Circaea vulpere</td>
<td>Amerika - ori - azami</td>
<td>(+)</td>
<td>A</td>
<td>AL RA</td>
</tr>
<tr>
<td>Apiales</td>
<td>Cotula coronopifolia</td>
<td>Ushio - shika - giku</td>
<td>(+)</td>
<td>-</td>
<td>AL RA</td>
</tr>
<tr>
<td>Apiales</td>
<td>Erinus amurensis</td>
<td>Mine - joun</td>
<td>(+)</td>
<td>A</td>
<td>AL RA</td>
</tr>
<tr>
<td>Apiales</td>
<td>Erinus singularis</td>
<td>Heraba - mine - joun</td>
<td>(+)</td>
<td>A</td>
<td>AL RA</td>
</tr>
<tr>
<td>Apiales</td>
<td>Phacelospora zapotenirolez</td>
<td>Mekash - yomogi - zoku</td>
<td>+</td>
<td>+</td>
<td>AL CR</td>
</tr>
<tr>
<td>Apiales</td>
<td>Galinsoga parviflora</td>
<td>Kogome - giku</td>
<td>+</td>
<td>B</td>
<td>AL RA</td>
</tr>
<tr>
<td>Apiales</td>
<td>Graphaimum piliferum</td>
<td>Hafuku - gusa zoku</td>
<td>+</td>
<td>B</td>
<td>AL RA</td>
</tr>
<tr>
<td>Apiales</td>
<td>Graphaimum sylvaticum</td>
<td>Edochu - chikko - gusa</td>
<td>(+)</td>
<td>B</td>
<td>AL OF</td>
</tr>
<tr>
<td>Apiales</td>
<td>Graphaimum uliginosum</td>
<td>Hime - ochichi - gusa</td>
<td>+</td>
<td>B</td>
<td>AL OF</td>
</tr>
<tr>
<td>Apiales</td>
<td>Helenium tuberosus</td>
<td>Kiku - imo</td>
<td>(+)</td>
<td>B</td>
<td>AL</td>
</tr>
</tbody>
</table>

1) Scientific names in Japan 1) refer to the Japanese names of the plants mentioned in the table.
2) Distribution by Terrestrial 2) indicates the distribution of the species in terrestrial environments.
3) Our result 3) shows the results obtained from our study.
4) Period 4) refers to the period of observation or collection.
<table>
<thead>
<tr>
<th>Family</th>
<th>Scientific names in Japan 1</th>
<th>JAPANESE NAME</th>
<th>Distribution by literatures 2</th>
<th>Our result 3</th>
<th>Period 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asteraeae</td>
<td>Hieracium aurantiacum</td>
<td>Kenin-tanpoop</td>
<td>+</td>
<td>-</td>
<td>AL RA (+) (+)</td>
</tr>
<tr>
<td>Asteraeae</td>
<td>Pilocephalum flordumba</td>
<td>Yanagi-tanpoop zoku</td>
<td>-</td>
<td>-</td>
<td>AL RA (+) (+)</td>
</tr>
<tr>
<td>Asteraeae</td>
<td>Lactuca indica</td>
<td>Aki-no-rosengi</td>
<td>+</td>
<td>+</td>
<td>AL - +</td>
</tr>
<tr>
<td>Asteraeae</td>
<td>Leontodon autumnalis</td>
<td>Aki-no-tanpolo-modoki</td>
<td>- D</td>
<td>-</td>
<td>AL OF (+) (+)</td>
</tr>
<tr>
<td>Asteraeae</td>
<td>Lactanius vulgare</td>
<td>Tanrusu-giho</td>
<td>-</td>
<td>-</td>
<td>AL OF (+) (+)</td>
</tr>
<tr>
<td>Asteraeae</td>
<td>Matricaria perforata</td>
<td>Inu-kanturere</td>
<td>+ (+) A3</td>
<td>+</td>
<td>AL RA (+) (+)</td>
</tr>
<tr>
<td>Asteraeae</td>
<td>Rubuscalia hirta</td>
<td>Arae-gongorou</td>
<td>+ (+) B</td>
<td>-</td>
<td>AL RA (+) (+)</td>
</tr>
<tr>
<td>Asteraeae</td>
<td>Rubuscalia lancetina</td>
<td>O-gongorou</td>
<td>- + A2</td>
<td>-</td>
<td>AL UF (+) (+)</td>
</tr>
<tr>
<td>Asteraeae</td>
<td>Sonchus arvensis</td>
<td>Tawaran-hachijon</td>
<td>- + A3</td>
<td>-</td>
<td>AL RA (+) (+)</td>
</tr>
<tr>
<td>Asteraeae</td>
<td>Sonchus oleraceus</td>
<td>Haru-no-rosengi</td>
<td>- +</td>
<td>+</td>
<td>AL OF (+) (+)</td>
</tr>
<tr>
<td>Asteraeae</td>
<td>Taraxacum hortepilae</td>
<td>Tarepoz zoku</td>
<td>-</td>
<td>-</td>
<td>AL OF (+) (+)</td>
</tr>
<tr>
<td>Asteraeae</td>
<td>Xanthium sibiricum</td>
<td>Chameni</td>
<td>+</td>
<td>+</td>
<td>AL RA (+) (+)</td>
</tr>
<tr>
<td>Botanical</td>
<td>U Phillipsianus glanduliferi</td>
<td>Osu-taurure-iso</td>
<td>-</td>
<td>-</td>
<td>AL OF (+) (+)</td>
</tr>
<tr>
<td>Boraginaceae</td>
<td>Borago officinalis</td>
<td>Ruc-jisa</td>
<td>- (+) (+)</td>
<td>-</td>
<td>AL RA (+) (+)</td>
</tr>
<tr>
<td>Brassicaeae</td>
<td>Armoracia rusticana</td>
<td>Seiyu-wasabi</td>
<td>+ (+) A3</td>
<td>-</td>
<td>AL CU OF (+) (+)</td>
</tr>
<tr>
<td>Brassicaeae</td>
<td>Brassica juncea</td>
<td>Kariashina</td>
<td>+ (+) B</td>
<td>-</td>
<td>AL RA (+) (+)</td>
</tr>
<tr>
<td>Brassicaeae</td>
<td>Brassica rapa var. oleacea</td>
<td>Aburana</td>
<td>+ (+)</td>
<td>-</td>
<td>AL RA (+) (+)</td>
</tr>
<tr>
<td>Brassicaeae</td>
<td>Erysimum cheiranthoides</td>
<td>Ezo-suushiro</td>
<td>- +</td>
<td>-</td>
<td>AL RA (+) (+)</td>
</tr>
<tr>
<td>Brassicaeae</td>
<td>Brassica oleracea var. hortensis</td>
<td>Euclidium zoku</td>
<td>-</td>
<td>-</td>
<td>AL RA (+) (+)</td>
</tr>
<tr>
<td>Brassicaeae</td>
<td>Brassica oleracea var. visentini</td>
<td>Visenti-daimi</td>
<td>-</td>
<td>-</td>
<td>AL RA (+) (+)</td>
</tr>
<tr>
<td>Brassicaeae</td>
<td>Thlaspi arvense</td>
<td>Gumbi-nazuna</td>
<td>+ (+) B</td>
<td>-</td>
<td>AL RA (+) (+)</td>
</tr>
<tr>
<td>Caryophyllaceae</td>
<td>Sagina procumbens</td>
<td>Arotu-zemusuka</td>
<td>+ (+) B</td>
<td>-</td>
<td>AL OF (+) (+)</td>
</tr>
<tr>
<td>Caryophyllaceae</td>
<td>Stellaria alba</td>
<td>Metasui-senno</td>
<td>-</td>
<td>-</td>
<td>AL RA (+) (+)</td>
</tr>
<tr>
<td>Caryophyllaceae</td>
<td>Stellaria neglecta</td>
<td>Obata-sato</td>
<td>- (+) B O</td>
<td>-</td>
<td>AL RA (+) (+)</td>
</tr>
<tr>
<td>Caryophyllaceae</td>
<td>Spergularia rubra</td>
<td>Usaini-tsemusuka</td>
<td>+ (+) B</td>
<td>-</td>
<td>AL OF (+) (+)</td>
</tr>
<tr>
<td>Caryophyllaceae</td>
<td>Stellaria graminea</td>
<td>Karafuto-hosoba-hakobe</td>
<td>- (+) A3</td>
<td>+</td>
<td>AL RA (+) (+)</td>
</tr>
<tr>
<td>Caryophyllaceae</td>
<td>Gypsophila arvensis</td>
<td>Seiyu-hinga</td>
<td>-</td>
<td>-</td>
<td>AL UF (+) (+)</td>
</tr>
<tr>
<td>Cyperaceae</td>
<td>Carex crebra</td>
<td>Kushiro-yagami-sugi</td>
<td>-</td>
<td>-</td>
<td>AL RA (+) (+)</td>
</tr>
<tr>
<td>Cyperaceae</td>
<td>Carex levisima</td>
<td>Hime-mikoshi-gaya</td>
<td>- +</td>
<td>-</td>
<td>AL RA (+) (+)</td>
</tr>
<tr>
<td>Elytrigiaeae</td>
<td>Elytrigia multiforma var. hortensis</td>
<td>Tie-gumi</td>
<td>+ +</td>
<td>+</td>
<td>AL CU RA (+) (+)</td>
</tr>
<tr>
<td>Ephedraceae</td>
<td>Ephedra austro-asiatica</td>
<td>Ein-kusa</td>
<td>-</td>
<td>-</td>
<td>AL RA (+) (+)</td>
</tr>
<tr>
<td>Fabaceae</td>
<td>Fabariae durius</td>
<td>Gege zoku</td>
<td>-</td>
<td>-</td>
<td>AL (RA (+) (+)</td>
</tr>
<tr>
<td>Fabaceae</td>
<td>Lathyrus pratensis</td>
<td>Kibana-no-reniso</td>
<td>+ (+) D</td>
<td>B</td>
<td>AL RA (+) (+)</td>
</tr>
<tr>
<td>Fabaceae</td>
<td>Lupinus nootkatensis</td>
<td>Lupinos</td>
<td>+</td>
<td>-</td>
<td>AL OF (+) (+)</td>
</tr>
<tr>
<td>Fabaceae</td>
<td>Robinia pseudoacacia</td>
<td>Haru-getsu</td>
<td>- (+) A2</td>
<td>-</td>
<td>AL UF (+) (+)</td>
</tr>
<tr>
<td>Fabaceae</td>
<td>Trifolium hybridum</td>
<td>Tachi-oranda-genya</td>
<td>- (+) A3</td>
<td>-</td>
<td>AL RA (+) (+)</td>
</tr>
<tr>
<td>Geraniaceae</td>
<td>Erinus cirratus</td>
<td>Otana-fura</td>
<td>- + B</td>
<td>-</td>
<td>AL RA (+) (+)</td>
</tr>
<tr>
<td>Grossulariaceae</td>
<td>Ribes uva-ursina</td>
<td>Manu-sugun</td>
<td>- + (+) B</td>
<td>-</td>
<td>AL UF (+) (+)</td>
</tr>
<tr>
<td>Iridaceae</td>
<td>Iris pseudacorus</td>
<td>Kii-shoku</td>
<td>- (-) A2</td>
<td>-</td>
<td>AL UF (+) (+)</td>
</tr>
<tr>
<td>Iridaceae</td>
<td>Spiranthes vanhouttei</td>
<td>Newakino zoku</td>
<td>-</td>
<td>-</td>
<td>AL (RA (+) (+)</td>
</tr>
<tr>
<td>Juncaceae</td>
<td>Juncus nodosus</td>
<td>Sasa zoku</td>
<td>-</td>
<td>-</td>
<td>AL OF (+) (+)</td>
</tr>
<tr>
<td>Lamiaceae</td>
<td>Echium pseudonosterata</td>
<td>Nagatana-baj-zoku</td>
<td>-</td>
<td>-</td>
<td>AL RA (+) (+)</td>
</tr>
<tr>
<td>Lamiaceae</td>
<td>Galeopsis hirsuta</td>
<td>Yarukii-jia</td>
<td>-</td>
<td>-</td>
<td>AL RA (+) (+)</td>
</tr>
<tr>
<td>Lamiaceae</td>
<td>Galeopsis laxa</td>
<td>Chishima-akikosu zoku</td>
<td>-</td>
<td>-</td>
<td>AL RA (+) (+)</td>
</tr>
<tr>
<td>Lamiaceae</td>
<td>Nepeta cataria</td>
<td>Iru-hakka</td>
<td>- + B</td>
<td>-</td>
<td>AL - +</td>
</tr>
<tr>
<td>Liliaceae</td>
<td>Lilium lancifolium</td>
<td>Oni-yuri</td>
<td>- (+) B</td>
<td>-</td>
<td>AL UF (+) (+)</td>
</tr>
<tr>
<td>Malvaceae</td>
<td>Malva moschatell</td>
<td>Jakai-ori</td>
<td>-</td>
<td>-</td>
<td>AL RA (+) (+)</td>
</tr>
<tr>
<td>Moraceae</td>
<td>Cannabis sativa</td>
<td>Asa</td>
<td>- (+) A3</td>
<td>+</td>
<td>IN - (+)</td>
</tr>
<tr>
<td>Ordochaceae</td>
<td>Odontites vulgaris</td>
<td>Odontites zoku</td>
<td>-</td>
<td>-</td>
<td>AL RA (+) (+)</td>
</tr>
<tr>
<td>Ordochaceae</td>
<td>Rheumori angustifolius</td>
<td>Okooz-gejra</td>
<td>-</td>
<td>-</td>
<td>AL OF (+) (+)</td>
</tr>
<tr>
<td>Ordochaceae</td>
<td>Rheumori arctoalaskus</td>
<td>Okooz-gejra zoku</td>
<td>-</td>
<td>-</td>
<td>AL UF (+) (+)</td>
</tr>
<tr>
<td>Ordochaceae</td>
<td>Rheumori vermis</td>
<td>Okooz-gejra zoku</td>
<td>-</td>
<td>-</td>
<td>AL RA (+) (+)</td>
</tr>
<tr>
<td>Oxalidaceae</td>
<td>Oxalis corniculata</td>
<td>Katabani</td>
<td>- +</td>
<td>-</td>
<td>AL RA (+) (+)</td>
</tr>
<tr>
<td>Pinnaceae</td>
<td>Linum kaeferi</td>
<td>Kera-matus</td>
<td>+ B</td>
<td>-</td>
<td>IN - (+)</td>
</tr>
<tr>
<td>Plantaginaceae</td>
<td>Plantago lanceolata</td>
<td>Hera-ibako</td>
<td>- (-) A2</td>
<td>-</td>
<td>AL RA (+) (+)</td>
</tr>
<tr>
<td>Plantaginaceae</td>
<td>Plantago media</td>
<td>Shirobara-shoku</td>
<td>-</td>
<td>+</td>
<td>AL RA (+) (+)</td>
</tr>
<tr>
<td>Plantaginaceae</td>
<td>Digitalis purpurea</td>
<td>Kitueno-tubukuro</td>
<td>- (+) A3</td>
<td>-</td>
<td>AL UF (+) (+)</td>
</tr>
<tr>
<td>Plantaginaceae</td>
<td>Linaria vulgaris</td>
<td>Hodo-bunnen</td>
<td>+ (+) A3</td>
<td>-</td>
<td>AL UF (+) (+)</td>
</tr>
<tr>
<td>Plantaginaceae</td>
<td>Veronica chamaedrys</td>
<td>Karafuto-hoso-shoku</td>
<td>- B</td>
<td>-</td>
<td>AL RA (+) (+)</td>
</tr>
<tr>
<td>Plantaginaceae</td>
<td>Veronica persica</td>
<td>O-nunoh-fujiri</td>
<td>- (+) B</td>
<td>-</td>
<td>AL RA (+) (+)</td>
</tr>
<tr>
<td>Poaceae</td>
<td>Agrostis capillaris</td>
<td>Itsu-tonokusa</td>
<td>- (+) D</td>
<td>B</td>
<td>AL OF (+) (+)</td>
</tr>
<tr>
<td>Poaceae</td>
<td>Agrostis gigantea</td>
<td>Konanika-gusa</td>
<td>- (+) A3</td>
<td>-</td>
<td>AL UF (+) (+)</td>
</tr>
<tr>
<td>Poaceae</td>
<td>Alopecurus arenarius</td>
<td>Susume-no-teppu zoku</td>
<td>-</td>
<td>-</td>
<td>AL RA (+) (+)</td>
</tr>
<tr>
<td>Poaceae</td>
<td>Alopecurus geniculatus</td>
<td>Susume-no-teppu zoku</td>
<td>-</td>
<td>-</td>
<td>AL RA (+) (+)</td>
</tr>
<tr>
<td>Poaceae</td>
<td>Anthoxanthum odoratum</td>
<td>Haru-gaya</td>
<td>+ (+) A3</td>
<td>-</td>
<td>AL OF (+) (+)</td>
</tr>
<tr>
<td>Poaceae</td>
<td>Cenchrus gillii</td>
<td>Karasu-majz zoku</td>
<td>-</td>
<td>-</td>
<td>AL RA (+) (+)</td>
</tr>
<tr>
<td>Poaceae</td>
<td>Bromus inermis</td>
<td>Ku-suzume-no-shabiki</td>
<td>- (+) A3</td>
<td>-</td>
<td>AL RA (+) (+)</td>
</tr>
<tr>
<td>Poaceae</td>
<td>Cynodon dactylon</td>
<td>Kibashi-gaya</td>
<td>- (+) D</td>
<td>-</td>
<td>AL RA (+) (+)</td>
</tr>
<tr>
<td>Poaceae</td>
<td>Deschampsia caespitosa</td>
<td>Hisho-no-komesusuki</td>
<td>-</td>
<td>-</td>
<td>AL OF (+) (+)</td>
</tr>
<tr>
<td>Poaceae</td>
<td>Digitaria sanguinalis</td>
<td>Hisho</td>
<td>-</td>
<td>-</td>
<td>AL RA (+) (+)</td>
</tr>
<tr>
<td>Poaceae</td>
<td>Digitaria ischaemum</td>
<td>Ku-mehishika</td>
<td>+</td>
<td>+</td>
<td>AL RA (+) (+)</td>
</tr>
<tr>
<td>Poaceae</td>
<td>Digitaria violascens</td>
<td>Aki-mehishika</td>
<td>-</td>
<td>+</td>
<td>AL RA (+) (+)</td>
</tr>
<tr>
<td>Poaceae</td>
<td>Echinochloa crus-galli</td>
<td>Inube</td>
<td>-</td>
<td>+</td>
<td>AL RA (+) (+)</td>
</tr>
<tr>
<td>Poaceae</td>
<td>Echinochloa crus-galli</td>
<td>Inube zoku</td>
<td>-</td>
<td>+</td>
<td>AL RA (+) (+)</td>
</tr>
<tr>
<td>Poaceae</td>
<td>Zea mays</td>
<td>Stokk-majz incl. Nezapp</td>
<td>- (+) A3</td>
<td>+</td>
<td>AL UF (+) (+)</td>
</tr>
<tr>
<td>Poaceae</td>
<td>Elusius novae-angliae</td>
<td>Ezumoji zoku</td>
<td>-</td>
<td>-</td>
<td>AL RA (+) (+)</td>
</tr>
<tr>
<td>Poaceae</td>
<td>Festuca arundinacea</td>
<td>Osu-ushinoko-gusa</td>
<td>A3</td>
<td>-</td>
<td>AL UF (+) (+)</td>
</tr>
<tr>
<td>Poaceae</td>
<td>Festuca pratensis</td>
<td>Hisho-no-ushinoko-gusa</td>
<td>A3</td>
<td>-</td>
<td>AL OF (+) (+)</td>
</tr>
<tr>
<td>Poaceae</td>
<td>Holcus lanatus</td>
<td>Shosage-gaya</td>
<td>-</td>
<td>+</td>
<td>AL RA (+) (+)</td>
</tr>
<tr>
<td>Poaceae</td>
<td>Hordeum brachyantherum</td>
<td>Chishima-makusha</td>
<td>- (+)</td>
<td>+</td>
<td>AL (RA (+) (+)</td>
</tr>
</tbody>
</table>
Destributions are checked by the following literatures.

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.

2) + means native plants, (+) means naturalized plants. • means the locality, where the species in question has not been recorded. Destrributions are checked by the following literatures.

- For the Kuril Islands:

- For Sakhalin

- For Kamchatka

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-qty=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 Bluelist of Hokkaido is noted (A2, A3, B).

Stae and Quantity follow Barkalov (2009).


• — ” 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.
Flora List of Stolbovskyy (Shimanobori) Nature Observation Road, Kunashir Island

Yukie Kato\(^1\) and Tomoko Fukuda\(^2\)

\(^1\)Kushiro City Museum, Shunkodai 1-7, Kushiro, 085-0822 JAPAN, \(^2\)Department of Botany, National Museum of Nature and Science, 4-1-1, Amakubo, Tsukuba, 305-0005 JAPAN. E-mail: yukie.kato@city.kushiro.lg.jp

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 northward along 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).

Acknowledgements

We appreciated Antipin, M. A., Bobyr, I.G., Budaev, A., Loguntsev, A. E., and Nevedomskaya, I. A. of the State Natural Reserve “Kurilsky” for their help in our expedition. We thank to Dr. Hideki Takahashi for providing the opportunity of this 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.

References

MURATA, J. AND YONEKURA, K. 2013. Syllabus of the Vascular Plants of Japan Arranged in the Order of Phylogeny-
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* Andrés [Kobano-ithiyakusô]: Mixed forest

**POACEAE**
*Brachypodium sylvatum* (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，針広葉交林，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，針広葉交林，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，コウリンタンボボ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>
<thead>
<tr>
<th>Family (APG III)</th>
<th>Scientific name</th>
<th>2012</th>
<th>2013</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PTERIDOPHYTA</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dryopteridaceae</td>
<td>Dryopteris crassirhiza Nakai</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dryopteridaceae</td>
<td>Dryopteris expansa (C.Presl.) Fraser-Jenk. et Jermy</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>GYMNOSPERMAE</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pinacea</td>
<td>Abies sachalinensis (F.Schmidt) Mast.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pinacea</td>
<td>Picea jezoensis (Siebold et Zucc.) Carrière</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Taxaceae</td>
<td>Taxus cuspidata Siebold et Zucc.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>ANGIOSPERMAE</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adoxaceae</td>
<td>Sambucus racemosa L.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adoxaceae</td>
<td>Toxicodendron orientale Greene subsp. orientale</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Apiaceae (Umbelliferae)</td>
<td>Cypripedium canadensis (L.) DC. subsp. japonica (Hassk.) Hand.-Mazz.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Apiaceae (Umbelliferae)</td>
<td>Oenanthe javanica (Blume) DC. var. javanica</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Apiaceae (Umbelliferae)</td>
<td>Osmorhiza aristata (Thunb.) Rydb. var. aristata</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aquifoliaceae</td>
<td>Illex rigosa F.Schmidt var. rigosa</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Araliaceae</td>
<td>Aralia cordata Thumb. var. cordata</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Araliaceae</td>
<td>Kalopanax septemlobus (Thumb.) Koidz. var. septemlobus</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asparagaceae</td>
<td>Maianthemum dilatatum (A.Wood) A.Nelson et J.F.Macbr.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asparagaceae</td>
<td>Polygonatum odoratum (Mill.) Druce var. maximowiczii (F.Schmidt) Koidz.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asteraceae (Compositae)</td>
<td>Aster glehni F.Schmidt var. glehni</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asteraceae (Compositae)</td>
<td>Parasenecio hastatus (L.) H.Koyama subsp. orientalis (Kitam.) H.Koyama</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asteraceae (Compositae)</td>
<td>Parasenecio kantschatica (Maxim.) Kadota var. kantschatica</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asteraceae (Compositae)</td>
<td>Petasites japonicus (Siebold et Zucc.) Maxim. subsp. giganteus (G.Nicholson) Kitam.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asteraceae (Compositae)</td>
<td>Pterocephela elata (Hems.) C.Shift (Lactuca ruddiana Maxim. var. elata (Hems.) Kitam.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asteraceae (Compositae)</td>
<td>Senecio canabilius Less.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asteraceae (Compositae)</td>
<td>Solidago virgaurea L. subsp. leioarpa (Benth.) Hultén</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Balsaminaceae</td>
<td>Impatiens noli-tangere L.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Betulaceae</td>
<td>Betula ermanii Cham. var. ermanii</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Betulaceae</td>
<td>Betula platyphylla Sukaczew var. japonica (Miq.) H.Hara</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cornaceae</td>
<td>Cornus canadensis L.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cornaceae</td>
<td>Cornus controversa Hems. ex Prain var. controversa</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cyperaceae</td>
<td>Carex mollisilia Bong.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cyperaceae</td>
<td>Carex sachalinensis F.Schmidt var. sachalinensis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ericaceae</td>
<td>Chimbaphila japonica Miq.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ericaceae</td>
<td>Orthilia secunda (L.) House</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ericaceae</td>
<td>Pyrola alpina Andres</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ericaceae</td>
<td>Rhododendron pentandrum (Maxim.) Graven (Menziesia pentandra Maxim.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fagaceae</td>
<td>Quercus crispa Blume var. crispa</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hydrangeaceae</td>
<td>Hydrangea paniculata Siebold</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hydrangeaceae</td>
<td>Hydrangea petiolaris Siebold et Zucc.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hydrangeaceae</td>
<td>Schizophragma hydrangeoides Siebold et Zucc. var. hydrangeoides</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Juglandaceae</td>
<td>Juglans mandshurica Maxim. var. sachalinensis (Komatsu) Kitam.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lamiaceae (Labiatae)</td>
<td>Prunella vulgaris L. subsp. asiatica (Nakai)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Liliaceae</td>
<td>Clintonia udensis Trautv. et C.A.Mey.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Liliaceae</td>
<td>Lilium medeoloides A.Gray var. medeoloides</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Liliaceae</td>
<td>Streptopus amplexifolius (L.) DC. var. papillosus Ohwi</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Magnoliaceae</td>
<td>Magnolia obvata Thunb.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Melastomaceae</td>
<td>Paris verticillata M.Bieb.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Melastomaceae</td>
<td>Trillium camtschatense Ker Gawl.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Melastomaceae</td>
<td>Veratrum oxysepalum Turcz. var. oxysepalum</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Onagraceae</td>
<td>Circaea alpina L. subsp. alpina</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Orchidaceae</td>
<td>Cephalanthera longibracteata Blume</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Orchidaceae</td>
<td>Epipactis papillosa Franck. et Sav. var. papillosa</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plantaginaceae</td>
<td>Plantago asiatica L.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Poaceae (Gramineae)</td>
<td>Brachypodium japonicum (Honda)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Poaceae (Gramineae)</td>
<td>Brachypodium japonicum (Honda)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Poaceae (Gramineae)</td>
<td>Brachypodium japonicum (Honda)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ranunculaceae</td>
<td>Cimicifuga simplex (DC.) Wormsk. ex Turcz.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ranunculaceae</td>
<td>Ranunculus arvensis L.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rosaceae</td>
<td>Agrimonia pilosa Ledeb. var. japonica (Miq.) Nakai</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rosaceae</td>
<td>Filipendula camtschatica (Pal.) Maxim.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rosaceae</td>
<td>Geum macrophyllum Willd. var. sachalinense (Koidz.) H.Hara</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rosaceae</td>
<td>Paeonia sikkimensis (F.Schmidt) C.K.Schmidt.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rosaceae</td>
<td>Sorbus commixta Hedl. var. commixta</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rubiaceae</td>
<td>Galium trifloriforme Kom.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rutaceae</td>
<td>Sinningia japonica Thumb. var. intermedia Komatsu f. repens (Nakai)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sapindaceae</td>
<td>Acer pictum Thumb.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sapindaceae</td>
<td>Acer tataricum Turcz. et C.A.Mey.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Saxifragaceae</td>
<td>Saxifraga fusca Maxim., subsp. fusca</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ulmaceae</td>
<td>Ulmus davidiana Planch. var. japonica (Rehder) Nakai</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ulmaceae</td>
<td>Ulmus japonica (Thunb.) Mayr</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Urticaceae</td>
<td>Urtica playphylla Wedd.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Sp. = Specimens 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 3. Signboard for the Stolbovskyy nature observation road.

Figure 4. Mixed forest landscape.

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

Yukie Kato and Hiroyuki Sato

1Kushiro City Museum, Shunkodai 1-7, Kushiro, 085-0822 JAPAN, 2Graduate School of Agriculture, Hokkaido University, N9 W9, Kita-ku, Sapporo 060-8589 JAPAN. E-mail: yukie.kato@city.kushiro.lg.jp

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-Kuri'l'sk) was formed after the sea receded about 5000 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 was very rare community and only founded in Furukamappu and Shunkunai in Nemuro (Tatwaki and Hirano 1936; Tatwaki 1944). 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). Erica caulurn 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.

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

References

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.


加藤ゆき恵1, 佐藤広行2：国後島中部古箂布湿原の近年の状況

国後島中部太平洋側に位置する古箂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箂布湿原と極寒帯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。湿原北部の古箂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。

1 釧路市立博物館, 2 北海道大学大学院農学院
Colonization of Sandy Environment by Calamagrostis neglecta (Poaceae) in Serebryanoye Mire, Kunashir Island

Hiroyuki Sato
Graduate School of Agriculture, Hokkaido University, N9 W9, Kita-ku, Sapporo, 060-8589 JAPAN.
E-mail: hiro@museum.hokudai.ac.jp

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.

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 “Kurilekiy” 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.

References

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.


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）
Biodiversity and Biogeography of the Kuril Islands and Sakhalin (2014) 4, 35-41.

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

Hiroyuki Sato¹, Yukie Kato², Tomoko Fukuda³ and Hideki Takahashi⁴

¹ Graduate School of Agriculture, Hokkaido University, N9 W9, Kita-ku, Sapporo, 060-8589 JAPAN; ² Kushiro City Museum, J-7, Shunkodai, Kushiro, 085-0822 JAPAN; ³ Department of Botany, National Museum of Nature and Science, 4-1-1, Amakubo, Tsukuba, 305-0005 JAPAN; ⁴ The Hokkaido University Museum, N10 W8, Kita-ku, Sapporo, 060-0810 JAPAN

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]


Agrostis flaccida Hack. [Miyama-nukabo]
Agrostis gigantea Roth. [Komuka-gusa]

KUNASHIR:

ITURUP:

Agrostis scabra Willd. [Ezo-nukabo]

KUNASHIR:

ITURUP:

Anthoxanthum odoratum var. glabrescens (Čelak.) Asch. et Graebn. [Kenashi-Harugaya]

KUNASHIR:

ITURUP:

Anthoxanthum odoratum var. odoratum [Haru-gaya]

KUNASHIR:

Avena fatua L. [Karasu-mugi]

KUNASHIR:

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

KUNASHIR:

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

KUNASHIR:

ITURUP:

Bromus inermis Leyss. [Ko-suzumeno-chahiki]

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

Calamagrostis neglecta (Ehrh.) P.Gaertn., B.Mey. et Scherb.

KUNASHIR:

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

KUNASHIR:

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

KUNASHIR:


ITURUP:


KUNASHIR:

Calamagrostis angustifolia

Note: In the Kuril Islands, this species was recorded as Calamagrostis angustifolia Kom., Calamagrostis purpurea (Trin.) Trin. (SAPS042417, 042418, 042424, 042434-042439).


ITURUP:


KUNASHIR:

Calamagrostis hakonensis

Franch. et Sav. [Hime-nogariyasu]

KUNASHIR:


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.

KUNASHIR:

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

Calamagrostis langsdorffii (Link) Tzvelev for this species in Japan. However, based on field observations and a herbarium study, the first author considers that C. epigeios is synonymous with C. neglecta. A comparative study with European C. stricta is considered necessary.
KUNASHIR:

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

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:

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

ITURUP:

Glyceria alnasteretum Kom. [Miyama-dojyō-tsunagi]
KUNASHIR:

Holcus lanatus L. [Shirage-gaya]
KUNASHIR:

KURILS:

Leymus mollis (Trin. ex Spreng.) Pilg. [Hama-nin’niku]
KUNASHIR:

Lolium perenne L. [Hoso-mugi]
KUNASHIR:

Miscanthus sinensis Andersson [Susuki]
KUNASHIR:
KURILS:

Festuca rubra L. [Ō-ushinoke-gusa]
KUNASHIR:


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.


*Moliniopsis japonica* (Hack.) Hayata [Numa-gaya]


*Phalaris arundinacea* L. [Kusa-yoshi]


*Poa annua* L. [Suzumeno-katabira]


*Poa compressa* L. [Ko-ichigo-tsunagi]


*Poa macrocalyx* Trautv. et C.A.Mey. [Karafuto-ichigo-tsunagi]


*Poa palustris* L. [Numa-ichigo-tsunagi]


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


*Phleum pratense* L. [Ō-awagaeri]


*Poa palustris* L. [O-awagaeri]


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


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


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


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


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


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


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


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


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


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


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


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


**ITURUP:**


**Acknowledgements**

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

**References**


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

2012年の野外調査において、国後島と択捉島で50種のイネ科植物を探集し、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。さらに、帰化植物であるホソムギは南千島では初記録となる。

(1) 北海道大学大学院農学院
2 釧路市立博物館，
3 国立科学博物館植物研究部，
4 北海道大学総合博物館）
Aquatic Plants Collected in Kunashir and Iturup Islands, in 2012

Mami Yamazaki 1, Hiroyuki Sato 2, Yukie Kato 3, Tomoko Fukuda 4 and Hideki Takahashi 5

1 Sapporo Museum Activity Center, N1 W9, Kita-ku, Sapporo, 060-0001 JAPAN; 2 Graduate School of Agriculture, Hokkaido University, N9 W9, Kita-ku, Sapporo, 060-8589 JAPAN; 3 Kushiro City Museum, 1-7, Shunkodai, Kushiro, 085-0822 JAPAN; 4 Department of Botany, National Museum of Nature and Science, 4-1-1, Amakubo, Tsukuba, 305-0005 JAPAN; 5 The Hokkaido University Museum, N10 W8, Kita-ku, Sapporo, 060-0001 JAPAN.

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. Harra (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.

Acknowledgements

We are thankful to Dr. A. A. Taran for joining our field survey, and to Dr. Y. Kadota, A. Shimizu, and Dr. N. Murakami for sending us information regarding the type specimens of *Sparganium kawakamii* and for permission to examine herbarium specimens. We also thank Dr. H. Nagamasu, Dr. T. Shiga, Dr. T. Azuma for permission to examine herbarium specimens. This study was supported in part by a Grant-in-Aid to No. 21405009 for Scientific Research (B) from the Japan Society for the Promotion of Science to H. Takahashi.

References


APPENDIX

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

<Angiospermae>

**EQUISETACEAE**

*Equisetum fluviatile* L. [ Mizu-dokusa]


**ISOETACEAE**

*Isoetes asiatica* (Makino) Makino [Hime-mizunira]


<Angiospermae>

**ARACEAE**

*Leumna trisulca* L. [Hinzimo]


**CYPERACEAE**

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


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


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

Eleocharis margaritacea (Hultén) Miyabe et Kudô [Shiromonoharai]

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

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

Scirpus wichurae Boeck. [Aburagaya]

HALORAGACEAE
Myriophyllum spicatum L. [Hozakino-fusamo]

LENTIBULARIACEAE
Utricularia japonica Makino [Tanuki-mo]

MENYANTHACEAE
Menyanthes trifoliata L. [Mitsu-gasiwa]

POLYGONACEAE
Percicaria amphibia (L.) Delarbre [Ezono-mizutade]

POTAMOGETONACEAE
Potamogeton berchtoldii Fieber [Itomo]

Potamogeton compressus L. [Ezo-yamagane]

Potamogeton fryeri A. Benn. [Futo-hirumushiro]
*Potamogeton gramineus* L. [Ezono-hirumushiro]


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


*Potamogeton natans* L. [O-hirumushiro]


*Potamogeton perfoliatus* L [Hirohano-ebimo]


*Potamogeton praelongus* Wulfen [Nagaba-ebimo]


**Ranunculaceae**

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


*Ranunculus yesoensis* Nakai [Chitosebaika-mo]


**TYPHACEAE**

*Sparganium erectum* L. [Mikuri]


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


**Typha latifolia** L. [Gama]


**ZOSTERACEAE**

*Phyllospadix iwatensis* Makino [Baika-mo]


*Zostera asiatica* Miki [Ōamamo]


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


*Zostera marina* L. [Amamo]


山崎真実, 福田知子, 加藤ゆき恵, 佐藤広行, 高橋英樹: 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・択捉島が多かった水草は、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。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, シジキ属は今回も見つかった。
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,
 3 釧路市立博物館,
 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.

Potamogeton maackianus A. Benn. [Sen-ninmo]

Potamogeton natans L. [O-hirumushiro]

Potamogeton perfoliatus L [Hirohano-ebimo]

Potamogeton praelongus Wulfen [Nagaba-ebimo]

Ranunculaceae

Ranunculus nipponicus Nakai var. submerges H. Harai [Baika-mo]

Ranunculus yesoensis Nakai [Chitosebaika-mo]

TYPHACEAE

Sparganium erectum L. [Mikuri]

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

Typha latifolia L. [Gama]

ZOSTERACEAE

Phyllospadix iwatensis Makino [Baika-mo]

Zostera asiatica Miki [Ōamamo]

Zostera japonica Asch. et Graebn. [Koamamo]

Zostera marina L. [Amamo]

Zostera marina L. [Amamo]
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.
E-mail: hide@museum.hokudai.ac.jp

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 Island (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. 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, Upur, and Keti 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* is one of the main tree components of lowland scrub in Peschanoye. The family composition is explained by the small size of 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

We thank Antipin, M. A., Bobyr, I. G., Budaev, A., Loguntsev, A. E., and Nevedomskaya, I. A. of the State Natural Reserve "Kurilsky" for helping in our field expedition. We also thank D. E. Boufford for checking our manuscript linguistically. This study was supported in part by a Grant-in-Aid No. 21405009 for Scientific Research (B) from the Japan Society for the Promotion of Science to H. Takahashi.

APPENDIX.

List of vascular plants in Peschanoye mire, Kunashir Island

<Ferns and Lycophytes>

**EQUISETACEAE**

*Equisetum fluviatile* L. *[Mizu-dokusa]*


*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.

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

The number of species in parentheses.

**OSMUNDACEAE**
Osmundastrum cinnamomeum (L.) C.Presl. var. fokiense (Copel.) Tagawa [Yamadori-zennai]
H. Takahashi et al. 35074; T. Fukuda 2012-105.

**THELYPTERIDACEAE**
Thelypteris nipponica (Franch. et Sav.) Ching [Nikkō-shida]

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 et al. 35066.
Picea jezoensis (Siebold et Zucc.) Carrière [Ezo-matsu]
H. Takahashi, confirmed in the field.
Pinus pumila (Pall.) Regel [Hai-matsu] (Fig. 2E)

**<Angiospermae>**

**AMARANTHACEAE**
Salsola komarovii Iljin [Oka-hijiki]

**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]

**ASPARAGACEAE**
Hosta sieboldii (Paxton) J.W.Ingram var. lectifolia (Nakai) H.Hara [Tachi-gibōshi]

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. [Han-gosō]
H. Takahashi et al. 35099.
Solidago virgaurea L. subsp. leiocarpa (Benth.) Hultén var. leiocarpa (Benth.) A.Gray f. japolalpestris 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 L. [Sawa-gikyō]

**CARYOPHYLLACEAE**
Parnassia palustris var. palustris [Umebachi-sō]
H. Takahashi et al. 35106.

**CORNACEAE**
Cornus suecica L. [Ezo-gozen-tachibana]

**CYPERACEAE**
Carex cespitosa L. [Kabu-suge] New to Kunashir!
Y. Kato 2012-325.

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. japolalpestris Kitam. [Miyama-akino-kirin-sō]
H. Takahashi et al. 35071; H. Sato et al. 01621 (SAPS042381); Y. Kato 2012-042; T. Fukuda 2012-84.

**DROSERACEAE**
Drosera rotundifolia L. [Mōsen-goke]
Y. Kato 2012-072.

Eriophorum gracile K.Koch [Sagi-suge]

Eriophorum vaginatum L. subsp. fauriei (E.G.Camus) A. et D.Löve [Wata-suge]

Rhynchospora alba (L.) Vahl [Mikazuki-gusa]

Schoenoplectus tabernaemontani (C.C.Gmel.) Palla [Futo-i]

Schoenoplectus tabernaemontani (C.C.Gmel.) Palla [Futo-i]

Scirpus wichurae Boeck. [Abura-gaya]

**DROSERAECIAE**
Drosera rotundifolia L. [Mōsen-goke]
49
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.

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.

  H. Takahashi et al. 35094.

*Aegopodium podagraria* L. [Tsuru-kokemomo]

*Vaccinium oxycoccos* L. [Tsuru-kokemomo]

*Vaccinium vitis-idaea* L. [Kokemomo]
  H. Takahashi et al. 35078; Y. Kato 2012-037.

FABACEAE

*Lathyrus japonicus* Willd. [Hama-endō]

*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]

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]

JUNCACEAE
Juncus covillei
H. Takahashi et al. 35092.
Juncus filamentosus L. [Ezo-hosoi]

NYMPHAEACEAE
Nuphar pumila
H. Takahashi 35075; H. Sato et al. 01609 (SAPS042184), 01610, 01622, 01625 (SAPS042385), 01626 (SAPS042386).

LAMIACEAE
Lycopus uniflorus Michx. [Ezo-shirone]
T. Fukuda 2012-112.

MENTHACEAE
Mentha canadensis L. [ Hakka]
H. Takahashi et al. 35113; Y. Kato 2012-075.

SCUTELLARIAE
Scutellaria yezoensis Kudô [Ezo-namiki]

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

LYTHRACEAE
Lythrum salicaria L. [Ō-ushinoke-gusa]
H. Takahashi et al. 35102; Y. Kato 2012-075.

POLYGONACEAE
Phragmites australis (Ledeb.) Tatew. [Kusadaiwa]
H. Takahashi et al. 35097; H. Sato et al. 01623 (SAPS042383), 01624 (SAPS042384).

PLANTAGINACEAE
Phacellaria gracilis (M.Bieb. ex Steven) Satake [Nagaba-gishigishi]

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. langsdorffii (Link) Tsvelev [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. inaequana (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 Türecz. ex Griseb. [Hama-mugi]
H. Sato et al. 01610, 01611 (SAPS042180, 042181).

Festuca rubra L. [O-ushinokage-gusa]
H. Sato et al. 01609 (SAPS042184).

Glyceria alnasteretum Kom. [Miyama-dojojō-tsunagi]
H. Sato et al. 01630 (SAPS042390), 01631 (SAPS042391).

Leymus mollis (Trin. ex Spreng.) Pilg. [Hama-nin'niku]
H. Sato et al. 01602 (SAPS042186).

Moliniosis 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).

Pheum pratense L. [Ō-awa-gaeru] Naturalized!
Y. Kato 2012-048; H. Sato et al. 01590 (SAPS042187), 01622 (SAPS042382).

Phragmites australis (Cav.) Trin. ex Steud. [Yoshii]
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. 35010, 35100, 35182; H. Sato et al. 01590 (SAPS042187), 01622 (SAPS042382).

PRIMULACEAE
Veronica americana (Raf.) Schwein. ex Benth. [Ezono-kawajisha]
H. Takahashi et al. 35117; H. Sato 01514 (SAPS042149).

RANUNCULACEAE
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]

JUNCACEAE
Juncus covillei
H. Takahashi et al. 35092.
Juncus filamentosus L. [Ezo-hosoi]

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

ORIASTHACEAE
Pedicularis resupinata L. subsp. teucrifolia (M.Bieb. ex Steven)
T. Yamaz. [Birōdo-shiogama]
Coptis trifolia (L.) Salisb. [Mitsuba-ōren]
Y. Kato 2012-049; T. Fukuda 2012-81b.

Colua 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]

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]

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

Violaceae
Viola verecunda A.Gray [Tsubo-sumire]
H. Takahashi et al. 35119.

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

Note: This specimen has no flowers, so it is difficult to determine in species rank.
Vascular Plants Collected on the Veslovskiy Peninsula, 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.

E-mail: hide@museum.hokudai.ac.jp

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 Tsuji 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 described 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 Tsuji 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, and so on in 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 Tsuji 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 found at Notsuke. Seagrasses, such as Zostera, 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).

Acknowledgements

We thank M. A. Antipin, I. G. Bobyr, A. Budaev, A. E. Loguntsnev and I. A. Nevedomskaya of the State Natural Reserve “Kurilsky” for their help in our expedition. We express our thanks to M. Yamazaki for identifying some of the aquatic plants. We also thank D.E. Boufford for checking our manuscript linguistically. This study was supported in part by a Grant-in-Aid No. 21405009 for Scientific Research (B) from the Japan Society for the Promotion of Science to H. Takahashi.

References


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

<table>
<thead>
<tr>
<th>Rank</th>
<th>Notsuke</th>
<th>Rank</th>
<th>Veslovskiy</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Asteraceae (21)</td>
<td>1</td>
<td>Asteraceae (14)</td>
</tr>
<tr>
<td>2</td>
<td>Poaceae (18)</td>
<td>2</td>
<td>Poaceae (13)</td>
</tr>
<tr>
<td>3</td>
<td>Rosaceae (17)</td>
<td>3</td>
<td>Caryophyllaceae (6)</td>
</tr>
<tr>
<td>4</td>
<td>Cynareae (12)</td>
<td>4</td>
<td>Cynareae (5)</td>
</tr>
<tr>
<td>5</td>
<td>Apiaceae (8)</td>
<td>5</td>
<td>Juncareae (4)</td>
</tr>
<tr>
<td>6</td>
<td>Ranunculaceae (8)</td>
<td>6</td>
<td>Amaranthaceae (3)</td>
</tr>
<tr>
<td>7</td>
<td>Ericaceae (7)</td>
<td>7</td>
<td>Apiaceae (3)</td>
</tr>
<tr>
<td>8</td>
<td>Violaceae (7)</td>
<td>8</td>
<td>Polygonaceae (3)</td>
</tr>
<tr>
<td>9</td>
<td>Caryophyllaceae (6)</td>
<td>9</td>
<td>Zosteraceae (3)</td>
</tr>
<tr>
<td>10</td>
<td>Juncareae (6)</td>
<td>10</td>
<td>Lamiaceae (2)</td>
</tr>
<tr>
<td>11</td>
<td>Polygonaceae (5)</td>
<td>11</td>
<td>Plantaginaceae (2)</td>
</tr>
<tr>
<td></td>
<td>Fabaceae (5)</td>
<td></td>
<td>Rosaceae (2)</td>
</tr>
<tr>
<td></td>
<td>Plantaginaceae (5)</td>
<td></td>
<td>Rubiaceae (2)</td>
</tr>
</tbody>
</table>

The number of species in parentheses.
APPENDIX.
List of vascular plants on the Veslovskiy peninsula, Kunashir Island

AMARANTHACEAE
Atriplex patens (L.) Iljin [Hosoba-hama-akaza]
Atriplex subcordata Kitag. [Hama-akaza]
Salicornia europaea L. [Akkeshi-sō]

APIACEAE
Bupleurum longiradiatum Turcz. [Hotaru-saiko s.l.]
H. Takahashi et al. 35254.
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. [Kita-nokogirisō]
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]
Artemisia koidzuii 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.

GERANIACEAE
Geranium yessoense Franch. et Sav. [Ezo-hūro]

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 scrub 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]

**Juncus decipiens** (Buchenau) Nakai [Igusa]
Y. Kato 2012-149.

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

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

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

OROBLANCHACEAE
Rhinanthus minor L. [Okuezo-garagara] Naturalized!

PLANTAGINACEAE
Hippuris vulgaris L. [Sugina-mo]

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.) Koeler subsp. langsdorfii (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 01549, 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, Hama-nin’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, 01700.

Trisetum sibiricum Rupr. [Chishima-kanitsuri]
H. Takahashi 35251; H. Sato 01558, 01559, 01560, 01561.

POLYGONACEAE
Polygonum aviculare L. subsp. neglectum (Besser) Arcang. [Okumichiyanagi] Naturalized!
H. Takahashi et al. 35235.

Polygonum polycneuron Franch. et Sav. [Akino-michiyanagi] 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. [Umimidori]

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]

ZOSTERACEAE
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取し、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。

(1) 北海道大学総合博物館,
(2) 北海道大学大学院農学院,
(3) 釧路市立博物館,
(4) 国立科学博物館植物研究部)
Vascular Plants Collected at Tornaya Bay, Iturup Island in 2012

Hideki Takahashi¹ and Tomoko Fukuda²

¹The Hokkaido University Museum, N10 W8, Kita-ku, Sapporo, 060-0810 JAPAN; ²Department of Botany, National Museum of Nature and Science, 4-1-1, Amakubo, Tsukuba, 305-0005 JAPAN. E-mail: hide@museum.hokudai.ac.jp

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 Pereshyek (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 Urup-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 Orobancheaeae 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. *sucapitata* 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. sucapitata* 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* Tatew. & Ohwi (Boraginaceae) with hairs on the inner surface of the corolla tube (Fukuda and Takahashi 2002) is situated between Parusnaya Bay (Porosu) and So’ta Bay (Sokya) on Iturup Island, which includes the present region. But as the specimens were fruiting plants, we could not confirm the forma.

**Acknowledgements**

We thank M. A. Antipin, I. G. Bobyr, A. Budaev, A. E. Loguntshev and I. A. Nevedomskaya of the State Natural Reserve “Kurilskiy” for their help in our field research. We express our thanks to M. Yamazaki and T. Sato for their help in identifying the aquatic plants and Poaceae. We also thank D.E. Boufford for checking our manuscript linguistically. This study was supported in part by a Grant-in-Aid No. 21405009 for Scientific Research (B) from the Japan Society for the Promotion of Science to H. Takahashi.

**References**


**Table 1.** A comparison of the ten dominant families in the Kurils.

<table>
<thead>
<tr>
<th>Rank</th>
<th>S. Kurils</th>
<th>Rank</th>
<th>Tornaya Bay</th>
<th>Rank</th>
<th>M. Kurils</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Cyperaceae (114)</td>
<td>1</td>
<td>Asteraceae (14)</td>
<td>1</td>
<td>Cyperaceae (42)</td>
</tr>
<tr>
<td>2</td>
<td>Poaceae (97)</td>
<td>2</td>
<td>Poaceae (10)</td>
<td>2</td>
<td>Poaceae (40)</td>
</tr>
<tr>
<td>3</td>
<td>Asteraceae (76)</td>
<td>3</td>
<td>Rosaceae (8)</td>
<td>3</td>
<td>Asteraceae (31)</td>
</tr>
<tr>
<td>4</td>
<td>Rosaceae (50)</td>
<td>4</td>
<td>Ranunculaceae (8)</td>
<td>4</td>
<td>Rosaceae (19)</td>
</tr>
<tr>
<td>5</td>
<td>Orchidaceae (42)</td>
<td>5</td>
<td>Fabaceae (6)</td>
<td>5</td>
<td>Orchidaceae (18)</td>
</tr>
<tr>
<td>6</td>
<td>Ericaceae (38)</td>
<td>6</td>
<td>Juncaceae (6)</td>
<td>6</td>
<td>Juncaceae (16)</td>
</tr>
<tr>
<td>7</td>
<td>Ranunculaceae (34)</td>
<td>7</td>
<td>Apiaceae (6)</td>
<td>7</td>
<td>Orchidaceae (13)</td>
</tr>
<tr>
<td>8</td>
<td>Polygonaceae (28)</td>
<td>8</td>
<td>Orobanchaceae (5)</td>
<td>8</td>
<td>Caryophyllaceae (12)</td>
</tr>
<tr>
<td>9</td>
<td>Juncaceae (27)</td>
<td>9</td>
<td>Cyperaceae (3)</td>
<td>9</td>
<td>Ranunculaceae (10)</td>
</tr>
<tr>
<td>10</td>
<td>Lamiaceae (20)</td>
<td>10</td>
<td>Ericaceae (3)</td>
<td>10</td>
<td>Brassicaceae (10)</td>
</tr>
</tbody>
</table>

APPENDIX.
List of vascular 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 35501)

<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 arctium L. subsp. yezoense (Maek.) H.Ohashi et Yonek. [Chishima-kohama-giku]
C (HT & TF 35515)
Cirsium kantschaticum 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 kantschaticus (Maxim.) Kadota var. kantschaticus [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 riederi 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]
A (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)

Korippa 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]
A (HT & TF 35494; TF 2012-446)

CARYOPHYLLACEAE
Sagina procumbens L. [Araito-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 [Umebachi-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 Sopochinoye. 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. riishiresis (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 (Lede.) Ohwi [Chishima-genge]  
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)

Vicia unijuga A.Braun [Nanten-hagi]
B (HT & TF 35467)

GERANIACEAE
Halenia corniculata (L.) Cornaz [Hana-ikari]
B (HT & TF 35502)

GENTIANACEAE
Geranium erianthum DC. [Chishima-hūro]
B (HT & TF 35493; TF 2012-449)

GERANIACEAE
Geranium erianthum DC. [Chishima-hūro]
B (HT & TF 35493; TF 2012-449)

JUNCACEAE
Juncus bufonius L. [Hime-kōgai-zekishō]
A (HT & TF 35432)

Juncus covillei P.Berry [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!
B (HT & TF 35425, 35458; TF 2012-517)

LILIACEAE
Lilium medeoloides A.Gray [Kuruma-yuri]
C (HT & TF 35531)

LILIACEAE
Lilium meleagroides 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)

PRIMULACEAE
Primula farinosa L. subsp. asiatica (Nakai) H.Hara [Utsubo-gusa]
B (HT & TF 35473)

POLYGONACEAE
Bistorta vivipara (L.) Delarbre [Mukago-toranoo]
C (HT & TF 35526)

RANUNCULACEAE
Aconitum maximum Pall. ex DC. subsp. maximum [Chishima-torikabuto]
B (HT & TF 35520)

RANUNCULACEAE
Aconitum maximum Pall. ex DC. subsp. maximum [Chishima-torikabuto]
B (HT & TF 35520)

RANUNCULACEAE
Anemone narcissiflora L. var. villosissima (DC.) Hultén [Senkai-sō]
C (HT & TF 35527)

RANUNCULACEAE
Aconitum maximum Pall. ex DC. subsp. maximum [Chishima-torikabuto]
B (HT & TF 35520)

RANUNCULACEAE
Anemone narcissiflora L. var. villosissima (DC.) Hultén [Senkai-sō]
C (HT & TF 35527)

RANUNCULACEAE
Aconitum maximum Pall. ex DC. subsp. maximum [Chishima-torikabuto]
B (HT & TF 35520)

RANUNCULACEAE
Anemone narcissiflora L. var. villosissima (DC.) Hultén [Senkai-sō]
C (HT & TF 35527)

RANUNCULACEAE
Aconitum maximum Pall. ex DC. subsp. maximum [Chishima-torikabuto]
B (HT & TF 35520)

RANUNCULACEAE
Anemone narcissiflora L. var. villosissima (DC.) Hultén [Senkai-sō]
C (HT & TF 35527)

RANUNCULACEAE
Aconitum maximum Pall. ex DC. subsp. maximum [Chishima-torikabuto]
B (HT & TF 35520)

RANUNCULACEAE
Anemone narcissiflora L. var. villosissima (DC.) Hultén [Senkai-sō]
C (HT & TF 35527)

RANUNCULACEAE
Aconitum maximum Pall. ex DC. subsp. maximum [Chishima-torikabuto]
B (HT & TF 35520)
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はなかった。むしろ塘路周辺ではマメ科、セリ科、ハマツボ科が主要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。

１ 北海道大学総合博物館, 2 国立科学博物館植物研究部
Inocybe (Agaricales, Inocybaceae) Collected in the Islands of Iturup and Kunashir

Takahito Kobayashi* and Yoshie Terashima

Iriomote Station, Tropical Biosphere Research Center, University of the Ryukyus, 870, Uehara, Taketomi, 907-1541 JAPAN.
*Corresponding author. E-mail: h138399@lab.u-ryukyu.ac.jp

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, which 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 pilepellis.

Taxonomy


Pileus 29-41 mm broad, convex to hemispherical, umbonate, with white velpellis on umbo, surface smooth, rimulose at margin, satiny, “fulvous” to “bay”. Lamellae adnexed, subdistant, with fimbriate white edges, “umber”. Stipe < 33 × 4.0-8.5 mm, somewhat swollen toward base (< 10.5 mm), satiny, striate, pruinose at the apex, solid, “white” to slightly yellow “c”. 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 × 4.5-5.5 µm (average value 9.4 × 5.0 µm), Q = 1.6-2.1 (average value 1.9), subamygdaliform, phaseoliform, with subconical apex. Basidia 28-35 × 7.5-9.5 µm,
4-spored, cylindrical to clavate, thin-walled, almost colorless to very pale yellow. Pleurocystidia 54-78 × 13.8-25.8 µm, cylindrical to fusiform, thick-walled (< 2.0 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 cylindrical, thin-walled, almost colorless to yellow. Hymenophoral trama subregular; hyphae 7.0-10.0 µm diam, sometimes swollen (< 20.0 µm), 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 µm thick, with hyphae 3.8-6.3 µm diam and agglutinating at the surface, almost colorless; the subtending layer < 43 µm thick, with hyphae 5.0-11.3 µm 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 *Inocibium* (Earle) Singer, section *Tardae* Bon, because it posses 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 × 7.0 mm, equal above a marginately bulbous base (< 10.5 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*: FeCl₃ · 6H₂O (20%) olive within 1 min. *Lamellae*: FeCl₃ · 6H₂O (20%) gradually pale olive within 15 min. *Stipe*: FeCl₃ · 6H₂O (20%) negative.

Basidiospores 7.3-10.1 × 4.5-5.8 µm (average value 8.7 × 5.2 µm), Q = 1.5-2.1 (average value 1.7), oblong to subamygdaliform. Basidia 31-34 × 8.3-9.5 µm, 4-spored, clavate, thin-walled, pale lemon. Pleurocystidia 58-83 × 10.8-18.8 µm, ventricose to fusiform, thick-walled (< 1.8 µm), very pale yellow, with colorless intracellular contents. Cheilocystidia similar to pleurocystidia, thick-walled. Paracystidia present along with cheilocystidia, often catenate with terminal cells 23-29 × 5.8-7.5 µm, broadly clavate to narrowly cylindrical, thin-walled, very pale yellow to yellow. Hymenophoral trama subregular; hyphae 5.0-8.8 µm diam, almost colorless. Caulocystidia descending to base, similar

![Figure 2. Basidiocarp of Inocybe splendens var. splendens. Scale bar: 10 mm.](image)

![Figure 3. Inocybe splendens var. splendens. A. Basidiospores. B. Section of basidiocarp. C. Pleurocystidia. Scale bars: A: 10 µm, B: 10 mm., C: 20 µm.](image)
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.


Japanese name: Kôtaku-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).


Pileus 9-16 mm broad, convex, umbo-nate, 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: FeCl_3 • 6H_2O (20%) gradually dark olive within 10 min. Lamellae: FeCl_3 • 6H_2O (20%) darkening immediately. Stipe: FeCl_3 • 6H_2O (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](image-url). Basidiocarps of Inocybe taxocystis. Scale bar: 10 mm.

![Figure 5](image-url). 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 Kobayasi 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.


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*: FeCl$_3$ • 6H$_2$O (20%) gradually dark olive within 15 min. *Lamellae*: FeCl$_3$ • 6H$_2$O (20%) olive immediately. *Stipe*: FeCl$_3$ • 6H$_2$O (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.


Japanese name: Kunashir-tomaya-take (Takahito Kobayashi).

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 intricata var. pallidistipata belongs to the subgenus Inocybe (= Clypeus Britzelm.), section Marginatae Kühner, since it possesses thick-walled caulocystidia throughout, and nodulose spores.

The authors are indebted to Professor Dr. Takahashi of Hokkaido University Museum for critical reading of this manuscript. The senior author would like to thank Dr. H. Hagiwara from Keio University Museum for providing literatures.

References


Acknowledgements

The authors are indebted to Professor Dr. Takahashi of Hokkaido University Museum for critical reading of this manuscript. The senior author would like to thank Dr. H. Hagiwara from National Museum of Nature and Science for providing literatures. This study was supported in part by a Grant-in-Aid No. 21405009 for Scientific Research (B) from the Japan Society for the Promotion of Science to H. Takahashi.

Little tree cookies:屹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、屹方四島から未報告のアセタケ属菌4種を载録した。

(1) Inocybe maculipes J. Favre カイトマヤタケ (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 オバパリトマヤタケ (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

Kuniko Kawai1, Mikhail P. Tiunov2, Norihisa Kondo3, Maksim A. Antipin4, Victor N. Boiko5, Noriyuki Ohtaishi5 and Hiroshi Dewa6


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 sacrumontis, Myotis gracilis, My. ikonnikovi, My. macrodactyly, My. petax and Murina assuriensis), 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 sacrumontis, 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 sikutanensis (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 have 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; Selezevna and Tiunov 2007). These authors have documented 8 species (Barbastella darjelingensis, Plecotus sacrumontis, Myotis gracilis, My. ikonnikovi, My. macrodactyly, My. petax, Murina hilendorfi and Ms. assuriensis) from Kunashir Island (Tiunov 1997; Selezevna and Tiunov 2007), and 4 species (Eptesicus nilssonii, Plecotus sacrumontis, 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 height; 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 epiphysseal 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 15FPMX), 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 (Tinuov 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 (Tinuov 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 Tinuov 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* Dobos (1875) (Tinuov 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 throughout 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.

<table>
<thead>
<tr>
<th>Locality number</th>
<th>Kunashir Is.</th>
<th>Longitude</th>
<th>Iturup Is.</th>
<th>Longitude</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Around the ranger hut in Saratovskaya (Seoi)</td>
<td>44.266 N</td>
<td>11</td>
<td>Branch of Kuybyshevka (Rubetsu) River</td>
</tr>
<tr>
<td>2</td>
<td>Branch of the Saratovskaya (Seoi) River</td>
<td>44.263 N</td>
<td>12</td>
<td>Reydovo (Betoboi) Hot spring</td>
</tr>
<tr>
<td>3</td>
<td>Junction with the Saratovskaya (Seoi) River</td>
<td>44.270 N</td>
<td>13</td>
<td>Forest road to Mt.Baranskogo (Sashiusuyama)</td>
</tr>
<tr>
<td>4</td>
<td>Around the ranger hut in Saratovskaya (Seoi)</td>
<td>44.266 N</td>
<td>14</td>
<td>Mouse of Rybak (Armoi) River</td>
</tr>
<tr>
<td>5</td>
<td>Branch of Filatova (Ryabetsu) River</td>
<td>44.194 N</td>
<td>15</td>
<td>Forest road to the Kuril’sky (Shana) observatory</td>
</tr>
<tr>
<td>6</td>
<td>Around the ranger hut in Filatova (Ryabetsu)</td>
<td>44.194 N</td>
<td>16</td>
<td>Kuril’sky (Shana) Salmon Hatchery</td>
</tr>
<tr>
<td>7</td>
<td>Forest road to Serebryanoye (Furukamappu) Lake</td>
<td>44.043 N</td>
<td>17</td>
<td>Branch of the Kuril’sky (Shana) River</td>
</tr>
<tr>
<td>8</td>
<td>Lagunnoye (Nikishoro) Sea Cave1</td>
<td>44.059 N</td>
<td>18</td>
<td>Dammed Lake on Branch of Mineral’naya (Onsen) River</td>
</tr>
<tr>
<td>9</td>
<td>Lagunnoye (Nikishoro) Sea Cave2</td>
<td>44.056 N</td>
<td>19</td>
<td>Forest road to Mt.Baranskogo (Sashiusuyama)</td>
</tr>
<tr>
<td>10</td>
<td>Forest road to the 13 km village (Yaitakotan)</td>
<td>44.028 N</td>
<td>20</td>
<td>Osennaya (Roumon) River Salmon Hatchery</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>21</td>
<td>Hillside of Mt.Perewal’naya (Noboriyama)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>22</td>
<td>Blagodatnoye (Toshimoni) Bridge</td>
</tr>
</tbody>
</table>

Honshu and Shikoku. It has been reported from Shikotan Island, Kunashir Island and Iturup Island (Tiuov 1997).

We recorded one male at site 17 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 (Tiuov 1997).

The systematic treatment of this species had been confusing. Several researchers had treated as a subspecies of M. branditi, 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 (Tiuov 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 (Tiuov 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.

<table>
<thead>
<tr>
<th>Species</th>
<th>Locality number</th>
<th>Date</th>
<th>Number of bats</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Male</td>
<td>Female</td>
</tr>
<tr>
<td><em>Eptesicus nilssonii</em></td>
<td>1</td>
<td>20100911</td>
<td>A1</td>
</tr>
<tr>
<td></td>
<td>14</td>
<td>20120829</td>
<td>A1</td>
</tr>
<tr>
<td><em>Barbastella leucomeles</em></td>
<td>6</td>
<td>20100915</td>
<td>A1</td>
</tr>
<tr>
<td><em>Plecotus sacrimontis</em></td>
<td>4</td>
<td>20100914</td>
<td>J1</td>
</tr>
<tr>
<td></td>
<td>13</td>
<td>20120828</td>
<td>A1</td>
</tr>
<tr>
<td></td>
<td>15</td>
<td>2010830</td>
<td>A2</td>
</tr>
<tr>
<td></td>
<td>21</td>
<td>20120905</td>
<td>J1</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>20120804</td>
<td>A1</td>
</tr>
<tr>
<td><em>Myotis gracilis</em></td>
<td>1</td>
<td>20100911</td>
<td>A1 U1 A2U3</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>20100912</td>
<td>A1</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>20100913</td>
<td>A1</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>20100914</td>
<td>J1</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>20109015</td>
<td>A2</td>
</tr>
<tr>
<td></td>
<td>11</td>
<td>20120826</td>
<td>A2J1</td>
</tr>
<tr>
<td></td>
<td>14</td>
<td>20120829</td>
<td>A2</td>
</tr>
<tr>
<td></td>
<td>15</td>
<td>20120830</td>
<td>A4</td>
</tr>
<tr>
<td></td>
<td>12</td>
<td>20120901</td>
<td>A2</td>
</tr>
<tr>
<td></td>
<td>18</td>
<td>20120901</td>
<td>A2</td>
</tr>
<tr>
<td></td>
<td>20</td>
<td>20120904</td>
<td>A1</td>
</tr>
<tr>
<td></td>
<td>21</td>
<td>20120905</td>
<td>A1</td>
</tr>
<tr>
<td><em>My. ikonncki</em></td>
<td>5</td>
<td>20100915</td>
<td>A1</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>20100915</td>
<td>J1</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>20100916</td>
<td>A1</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>20100918</td>
<td>A2</td>
</tr>
<tr>
<td><em>My. macroductylus</em></td>
<td>2</td>
<td>20100912</td>
<td>A3</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>20100913</td>
<td>A7</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>20100915</td>
<td>A4J1</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>20100918</td>
<td>A1</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>20110730</td>
<td>A1</td>
</tr>
<tr>
<td></td>
<td>9</td>
<td>20110730</td>
<td>A60J8 A12J1</td>
</tr>
<tr>
<td></td>
<td>9</td>
<td>20110731</td>
<td>A73J8 A54J5</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>20120804</td>
<td>A51</td>
</tr>
<tr>
<td></td>
<td>9</td>
<td>20120804</td>
<td>A54 A30</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>20130804</td>
<td>19 71</td>
</tr>
<tr>
<td></td>
<td>9</td>
<td>20130804</td>
<td>70 29</td>
</tr>
<tr>
<td><em>My. nattereri</em></td>
<td>1</td>
<td>20100911</td>
<td>A1J1</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>20100915</td>
<td>A1</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>20100916</td>
<td>J1</td>
</tr>
<tr>
<td><em>My. petax</em></td>
<td>2</td>
<td>20100912</td>
<td>A2J3 A2</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>20100913</td>
<td>A2</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>20100915</td>
<td>A2J1 J2</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>20100916</td>
<td>A1</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>20100918</td>
<td>A3</td>
</tr>
<tr>
<td></td>
<td>11</td>
<td>20120826</td>
<td>A2J1</td>
</tr>
<tr>
<td></td>
<td>14</td>
<td>20120829</td>
<td>A2J4 A8J2</td>
</tr>
<tr>
<td></td>
<td>15</td>
<td>20120830</td>
<td>A1</td>
</tr>
<tr>
<td></td>
<td>16</td>
<td>20120831</td>
<td>A2</td>
</tr>
<tr>
<td></td>
<td>17</td>
<td>20120831</td>
<td>A2</td>
</tr>
<tr>
<td></td>
<td>12</td>
<td>20120901</td>
<td>A1</td>
</tr>
<tr>
<td></td>
<td>18</td>
<td>20120901</td>
<td>A4J3 A7J3</td>
</tr>
<tr>
<td></td>
<td>20</td>
<td>20120904</td>
<td>A2</td>
</tr>
<tr>
<td></td>
<td>22</td>
<td>20120907</td>
<td>A2</td>
</tr>
<tr>
<td><em>Murina ussuriensis</em></td>
<td>1</td>
<td>20100911</td>
<td>A1</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>20100914</td>
<td>A1 J1</td>
</tr>
</tbody>
</table>

1: A: 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 (Tiuov 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* (Tiuov 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 (Tiuov 1997).

This species has been formerly included as a subspecies of *M. daubentoni*. 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 (Tiuov 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 (Tiuov 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.

<table>
<thead>
<tr>
<th>Species</th>
<th>Sex</th>
<th>Age</th>
<th>Total number of measured individuals</th>
<th>Forearm (mm) mean (min.-max)</th>
<th>Body weight (g) mean (min.-max)</th>
<th>Wing span (mm) mean (min.-max)</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Myotis macroactylus</em></td>
<td>F</td>
<td>A</td>
<td>43</td>
<td>38.24 (32.74-40.30)</td>
<td>9.1 (8.1-10.1)</td>
<td>260.0 (260-260)</td>
<td>BW N=9, FA N=43, WIN N=2</td>
</tr>
<tr>
<td></td>
<td>J</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>BW N=52, FA N=66, WIN N=17</td>
</tr>
<tr>
<td></td>
<td>M</td>
<td>A</td>
<td>66</td>
<td>37.44 (35.88-39.22)</td>
<td>8.2 (6.7-9.4)</td>
<td>253.8 (243-267)</td>
<td>BW N=3</td>
</tr>
<tr>
<td></td>
<td>J</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Myotis petax</em></td>
<td>F</td>
<td>A</td>
<td>4</td>
<td>37.04 (35.58-37.97)</td>
<td>7.95 (7.1-9.1)</td>
<td>255.3 (242-263)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>J</td>
<td>2</td>
<td></td>
<td>37.51 (36.38-38.64)</td>
<td>9.60 (9.3-9.9)</td>
<td>257.0 (252-262)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>M</td>
<td>A</td>
<td>8</td>
<td>36.62 (35.36-38.04)</td>
<td>8.44 (7.6-9.7)</td>
<td>250.6 (245-256)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>J</td>
<td>4</td>
<td></td>
<td>36.17 (34.24-37.34)</td>
<td>6.37 (5.0-7.7)</td>
<td>249.3 (229-264)</td>
<td>BW N=3</td>
</tr>
<tr>
<td><em>Myotis isonikovi</em></td>
<td>F</td>
<td>A</td>
<td>2</td>
<td>33.53 (32.84-34.21)</td>
<td>5.75 (5.3-6.2)</td>
<td>225.0 (222-228)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>J</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>M</td>
<td>A</td>
<td>3</td>
<td>33.75 (32.71-34.33)</td>
<td>6.17 (6.0-6.2)</td>
<td>226.3 (221-226)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>J</td>
<td>2</td>
<td></td>
<td>34.23 (34.12-34.33)</td>
<td>5.35 (4.7-6.0)</td>
<td>230.0 (228-225)</td>
<td></td>
</tr>
<tr>
<td><em>Myotis gracilis</em></td>
<td>F</td>
<td>A</td>
<td>2</td>
<td>34.84 (34.82-34.85)</td>
<td>7.50 (7.5-7.5)</td>
<td>236.0 (234-238)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>J</td>
<td>4</td>
<td></td>
<td>34.71 (33.74-36.25)</td>
<td>6.18 (5.0-8.0)</td>
<td>230.0 (226-233)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>M</td>
<td>A</td>
<td>4</td>
<td>33.43 (31.9-34.18)</td>
<td>6.28 (5.1-8.2)</td>
<td>223.8 (216-229)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>J</td>
<td>1</td>
<td></td>
<td>34.40</td>
<td>5.50</td>
<td>227.0</td>
<td></td>
</tr>
<tr>
<td><em>Myotis nattereri</em></td>
<td>F</td>
<td>A</td>
<td>1</td>
<td>40.30</td>
<td>6.8</td>
<td>264.0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>J</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>M</td>
<td>A</td>
<td>1</td>
<td>39.13</td>
<td>6.7</td>
<td>254.0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>J</td>
<td>1</td>
<td></td>
<td>38.55</td>
<td>5.90</td>
<td>255.0</td>
<td></td>
</tr>
<tr>
<td><em>Epitesicus nilssonii</em></td>
<td>F</td>
<td>A</td>
<td>0</td>
<td>38.89</td>
<td>15.80</td>
<td>265.0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>J</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Plecotus sacrimontis</em></td>
<td>F</td>
<td>A</td>
<td>0</td>
<td>43.51</td>
<td>9.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>J</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Barbastella leucomes</em></td>
<td>F</td>
<td>A</td>
<td>0</td>
<td>40.39</td>
<td>10.4</td>
<td>289.0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>J</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Murina ussuriensis</em></td>
<td>F</td>
<td>A</td>
<td>1</td>
<td>30.85</td>
<td>6.1</td>
<td>235.0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>J</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>M</td>
<td>A</td>
<td>2</td>
<td>28.71 (28.03-29.38)</td>
<td>5.45 (5.3-5.6)</td>
<td>216.5 (215-218)</td>
<td></td>
</tr>
</tbody>
</table>

1 F: female, M: male  2 A: adult, J: juvenile  3 The individuals of *M. macroactylus* 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 *Epitesicus 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.

Acknowledgements

We thank Dr. Hideki Takahashi (Hokkaido University Museum), Dr. Tomoko Fukuda (National Museum of Nature and Science, Tokyo), Mr. Ato Kakiuchi (interpreter), Junya Ozasa (interpreter), Mr. Grigoriy Y. Antonov (“Zapovednik Kurilski”), Mrs. Irina A. Nevedomskaya (“Zapovednik Kurilski”), Mr.
Table 5. Measurements of cranial and external characters of the bats captured in Kunashir Island.

<table>
<thead>
<tr>
<th>Species</th>
<th>Locality number</th>
<th>Date</th>
<th>Specimen number</th>
<th>Sex</th>
<th>BW (g)</th>
<th>FA (mm)</th>
<th>Wing span</th>
<th>TL (mm)</th>
<th>HBL (mm)</th>
<th>Tail (mm)</th>
<th>Tibia (mm)</th>
<th>Ear (mm)</th>
<th>Tragus (mm)</th>
<th>HFL1 (mm)</th>
<th>HFL2 (mm)</th>
<th>GL (mm)</th>
<th>CBL (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Myotis macrodactylus</td>
<td>3</td>
<td>20100913</td>
<td>2R00495</td>
<td>M</td>
<td>8.1</td>
<td>38.74</td>
<td>267</td>
<td>87.0</td>
<td>46.8</td>
<td>40.2</td>
<td>17.4</td>
<td>16.2</td>
<td>6.2</td>
<td>12.2</td>
<td>13.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Myotis macrodactylus</td>
<td>3</td>
<td>20100913</td>
<td>2R00501</td>
<td>M</td>
<td>8.0</td>
<td>38.00</td>
<td>257</td>
<td>90.0</td>
<td>44.8</td>
<td>45.2</td>
<td>17.3</td>
<td>14.2</td>
<td>6.2</td>
<td>12.0</td>
<td>13.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Myotis petax</td>
<td>3</td>
<td>20100913</td>
<td>2R00504</td>
<td>F</td>
<td>7.4</td>
<td>36.85</td>
<td>254</td>
<td>90.0</td>
<td>46.8</td>
<td>43.2</td>
<td>17.4</td>
<td>16.2</td>
<td>5.2</td>
<td>12.2</td>
<td>13.2</td>
<td>14.27</td>
<td>13.35</td>
</tr>
<tr>
<td>Myotis ikonnikovi</td>
<td>5</td>
<td>20100915</td>
<td>H2063</td>
<td>M</td>
<td>6.0</td>
<td>34.33</td>
<td>232</td>
<td>84.0</td>
<td>47.8</td>
<td>36.2</td>
<td>16.9</td>
<td>11.2</td>
<td>5.2</td>
<td>6.0</td>
<td>7.0</td>
<td>13.12</td>
<td>12.82</td>
</tr>
<tr>
<td>Myotis gracilis</td>
<td>2</td>
<td>20100912</td>
<td>H2058</td>
<td>M</td>
<td>6.0</td>
<td>33.67</td>
<td>224</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>13.75</td>
<td>13.58</td>
</tr>
<tr>
<td>Myotis nattereri</td>
<td>1</td>
<td>20100911</td>
<td>2R00484</td>
<td>F</td>
<td>8.5</td>
<td>40.47</td>
<td>279</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>15.10</td>
<td>14.69</td>
</tr>
<tr>
<td>Eptesicus nilssonii</td>
<td>1</td>
<td>20100911</td>
<td>2R00483</td>
<td>M</td>
<td>15.8</td>
<td>38.89</td>
<td>265</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>15.49</td>
<td>14.97</td>
</tr>
<tr>
<td>Plecotus sacimontis</td>
<td>1</td>
<td>20100914</td>
<td>2R00506</td>
<td>F</td>
<td>9.1</td>
<td>43.51</td>
<td>107</td>
<td>56.0</td>
<td>51.0</td>
<td>21.4</td>
<td>38.2</td>
<td>18.2</td>
<td>10.0</td>
<td>11.0</td>
<td>17.20</td>
<td>16.00</td>
<td></td>
</tr>
<tr>
<td>Barbastella leucomelas</td>
<td>4</td>
<td>20100915</td>
<td>2R00517</td>
<td>M</td>
<td>10.4</td>
<td>40.39</td>
<td>289</td>
<td>120.0</td>
<td>65.3</td>
<td>54.7</td>
<td>16.9</td>
<td>17.2</td>
<td>10.2</td>
<td>7.0</td>
<td>8.0</td>
<td>15.09</td>
<td>14.10</td>
</tr>
<tr>
<td>Maruna ussuriensis</td>
<td>4</td>
<td>20100914</td>
<td>H2062</td>
<td>M</td>
<td>5.3</td>
<td>29.38</td>
<td>215</td>
<td>80.0</td>
<td>30.2</td>
<td>14.6</td>
<td>14.2</td>
<td>7.2</td>
<td>3.6</td>
<td>7.2</td>
<td>15.16</td>
<td>14.13</td>
<td></td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Species</th>
<th>Sex</th>
<th>Age</th>
<th>Number of measured individuals</th>
<th>Forearm (mm) mean (min.-max)</th>
<th>Body weight (g) mean (min.-max)</th>
<th>Wing span (mm) mean (min.-max)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Myotis gracilis</td>
<td>F</td>
<td>A</td>
<td>6</td>
<td>34.55 (33.58-35.27)</td>
<td>6.2 (5.4-7.2)</td>
<td>234.8 (1)</td>
</tr>
<tr>
<td></td>
<td>M</td>
<td>A</td>
<td>6</td>
<td>34.89 (32.75-35.77)</td>
<td>5.6 (5.0-5.8)</td>
<td>235.2 (221-241)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>J</td>
<td></td>
<td></td>
<td>35.10</td>
<td>5.4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>J</td>
<td></td>
<td></td>
<td></td>
<td>240.0</td>
</tr>
<tr>
<td>Myotis petax</td>
<td>F</td>
<td>A</td>
<td>14</td>
<td>36.81 (35.29-37.9)</td>
<td>7.8 (6.4-9.8)</td>
<td>253.6 (247-263)</td>
</tr>
<tr>
<td></td>
<td>M</td>
<td>A</td>
<td>14</td>
<td>36.75 (36.18-37.66)</td>
<td>6.6</td>
<td>245.2 (238-250)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>J</td>
<td>4</td>
<td>36.92 (35.54-38.69)</td>
<td>8.0 (6.2-10.4)</td>
<td>252.0 (242-256)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>J</td>
<td></td>
<td></td>
<td>6.5 (5.6-7.2)</td>
<td>251.0 (249-254)</td>
</tr>
<tr>
<td>Plecotus sacimontis</td>
<td>F</td>
<td>A</td>
<td>1</td>
<td>40.58</td>
<td>10.0</td>
<td>278.0</td>
</tr>
<tr>
<td></td>
<td>M</td>
<td>A</td>
<td>2</td>
<td>42.14</td>
<td>11.0</td>
<td>280.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>J</td>
<td>0</td>
<td>40.99 (39.88-42.09)</td>
<td>8.3 (7.4-9.2)</td>
<td>284.5 (278-291)</td>
</tr>
<tr>
<td>Eptesicus nilssonii</td>
<td>F</td>
<td>A</td>
<td>0</td>
<td>38.67</td>
<td>10.8</td>
<td>271.0</td>
</tr>
<tr>
<td></td>
<td>M</td>
<td>A</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1 F: female, M: male
2 A: adult, J: juvenile
<table>
<thead>
<tr>
<th>Species</th>
<th>Locality number</th>
<th>Date</th>
<th>Specimen number</th>
<th>sex</th>
<th>BW</th>
<th>FA</th>
<th>Wing span</th>
<th>TL</th>
<th>HBL</th>
<th>Tail</th>
<th>Tibia</th>
<th>Ear</th>
<th>Tragus</th>
<th>HFL1</th>
<th>HFL2</th>
<th>GL</th>
<th>CBL</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Myotis petax</em></td>
<td>11</td>
<td>20120826</td>
<td>SR00322</td>
<td>M</td>
<td>7.6</td>
<td>37.0</td>
<td>257</td>
<td>85.0</td>
<td>45.0</td>
<td>40.0</td>
<td>18.4</td>
<td>16.0</td>
<td>6.0</td>
<td>10.0</td>
<td>9.0</td>
<td>14.09</td>
<td>13.27</td>
</tr>
<tr>
<td><em>Myotis petax</em></td>
<td>11</td>
<td>20120826</td>
<td>SR00324</td>
<td>M</td>
<td>7.0</td>
<td>36.5</td>
<td>250</td>
<td>86.0</td>
<td>49.0</td>
<td>37.0</td>
<td>18.1</td>
<td>14.0</td>
<td>6.5</td>
<td>10.0</td>
<td>8.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Myotis graciosus</em></td>
<td>11</td>
<td>20120826</td>
<td>H2115</td>
<td>F</td>
<td>5.8</td>
<td>33.6</td>
<td>225</td>
<td>84.0</td>
<td>47.0</td>
<td>37.0</td>
<td>15.2</td>
<td>15.0</td>
<td>7.0</td>
<td>8.0</td>
<td>7.0</td>
<td>13.55</td>
<td>12.68</td>
</tr>
<tr>
<td><em>Myotis graciosus</em></td>
<td>11</td>
<td>20120826</td>
<td>H2114</td>
<td>F</td>
<td>6.6</td>
<td>34.3</td>
<td>240</td>
<td>83.0</td>
<td>42.0</td>
<td>41.0</td>
<td>15.3</td>
<td>15.0</td>
<td>8.0</td>
<td>7.0</td>
<td>6.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Plecotus sacrarminus</em></td>
<td>19</td>
<td>20120828</td>
<td>SR00325</td>
<td>F</td>
<td>10.0</td>
<td>40.6</td>
<td>278</td>
<td>96.5</td>
<td>45.5</td>
<td>51.0</td>
<td>21.0</td>
<td>36.0</td>
<td>15.0</td>
<td>10.0</td>
<td>10.0</td>
<td>16.32</td>
<td>16.04</td>
</tr>
<tr>
<td><em>Plecotus sacrarminus</em></td>
<td>15</td>
<td>20120830</td>
<td>SR00352</td>
<td>M</td>
<td>7.4</td>
<td>39.9</td>
<td>278</td>
<td>110.0</td>
<td>59.0</td>
<td>51.0</td>
<td>19.1</td>
<td>36.0</td>
<td>17.0</td>
<td>11.0</td>
<td>10.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Eptesicus nilssonii</em></td>
<td>14</td>
<td>20120829</td>
<td>SR00351</td>
<td>M</td>
<td>10.8</td>
<td>38.7</td>
<td>271</td>
<td>100.0</td>
<td>53.0</td>
<td>47.0</td>
<td>17.3</td>
<td>13.0</td>
<td>12.0</td>
<td>10.0</td>
<td>9.0</td>
<td>15.47</td>
<td>15.21</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Species</th>
<th>Locality number</th>
<th>Date</th>
<th>Specimen number</th>
<th>sex</th>
<th>IM3</th>
<th>CM3</th>
<th>M3M3</th>
<th>MRW</th>
<th>ZW</th>
<th>BCW</th>
<th>BCWM</th>
<th>BCH</th>
<th>IOW</th>
<th>RL</th>
<th>BL</th>
<th>mCM3</th>
<th>LMD</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Myotis petax</em></td>
<td>11</td>
<td>20120826</td>
<td>SR00322</td>
<td>M</td>
<td>6.15</td>
<td>5.18</td>
<td>5.80</td>
<td>5.22</td>
<td>9.03</td>
<td>7.45</td>
<td>7.53</td>
<td>6.43</td>
<td>3.64</td>
<td>6.22</td>
<td>7.05</td>
<td>5.45</td>
<td>10.29</td>
</tr>
<tr>
<td><em>Myotis petax</em></td>
<td>11</td>
<td>20120826</td>
<td>SR00324</td>
<td>M</td>
<td>6.00</td>
<td>4.85</td>
<td>5.21</td>
<td>4.87</td>
<td>6.89</td>
<td>7.03</td>
<td>5.89</td>
<td>3.73</td>
<td>6.01</td>
<td>6.67</td>
<td>4.96</td>
<td>9.70</td>
<td></td>
</tr>
<tr>
<td><em>Myotis graciosus</em></td>
<td>11</td>
<td>20120826</td>
<td>H2115</td>
<td>F</td>
<td>6.00</td>
<td>4.85</td>
<td>5.21</td>
<td>4.87</td>
<td>6.89</td>
<td>7.03</td>
<td>5.89</td>
<td>3.73</td>
<td>6.01</td>
<td>6.67</td>
<td>4.96</td>
<td>9.70</td>
<td></td>
</tr>
<tr>
<td><em>Myotis graciosus</em></td>
<td>11</td>
<td>20120826</td>
<td>H2114</td>
<td>F</td>
<td>6.00</td>
<td>4.85</td>
<td>5.21</td>
<td>4.87</td>
<td>6.89</td>
<td>7.03</td>
<td>5.89</td>
<td>3.73</td>
<td>6.01</td>
<td>6.67</td>
<td>4.96</td>
<td>9.70</td>
<td></td>
</tr>
<tr>
<td><em>Plecotus sacrarminus</em></td>
<td>15</td>
<td>20120830</td>
<td>SR00352</td>
<td>M</td>
<td>6.67</td>
<td>5.55</td>
<td>7.15</td>
<td>6.51</td>
<td>10.23</td>
<td>8.26</td>
<td>8.62</td>
<td>7.05</td>
<td>4.48</td>
<td>6.55</td>
<td>8.66</td>
<td>6.05</td>
<td>11.32</td>
</tr>
</tbody>
</table>

Stanislav A. Merkulov ("Kurilskiy leskhoo") and Mr. Andrei Korablev ("Kurilskiy leskhoo") for supporting our survey. We are grateful to Lázaro M. Echenique-Díaz for comments and English proofreading. This work was supported by a Grant-in-Aid (KAKENHI) from the Ministry of Education, Culture, Sports, Science and Technology, Japan (to Kuniko Kawai, grant No. 20710180 and to Hideki Takahashi, grant No. 21405009).

References


河合久仁子 1, Mikhail P. Tiunov 2, 近藤家俊 3, Maksim A. Antipin 3, Victor N. Boiko 4, 大塚健之 3, 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なかった4種を捕獲した。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確認となった。

1 北海道大学北方生物圏フィールド科学センター
2 ロシア科学アカデミー極東支部生物土壤学研究所
3 根室市歴史と自然の資料館
4 “国後島保護区”
5 北海道大学総合博物館
6 オサラッベコウモリ研究所